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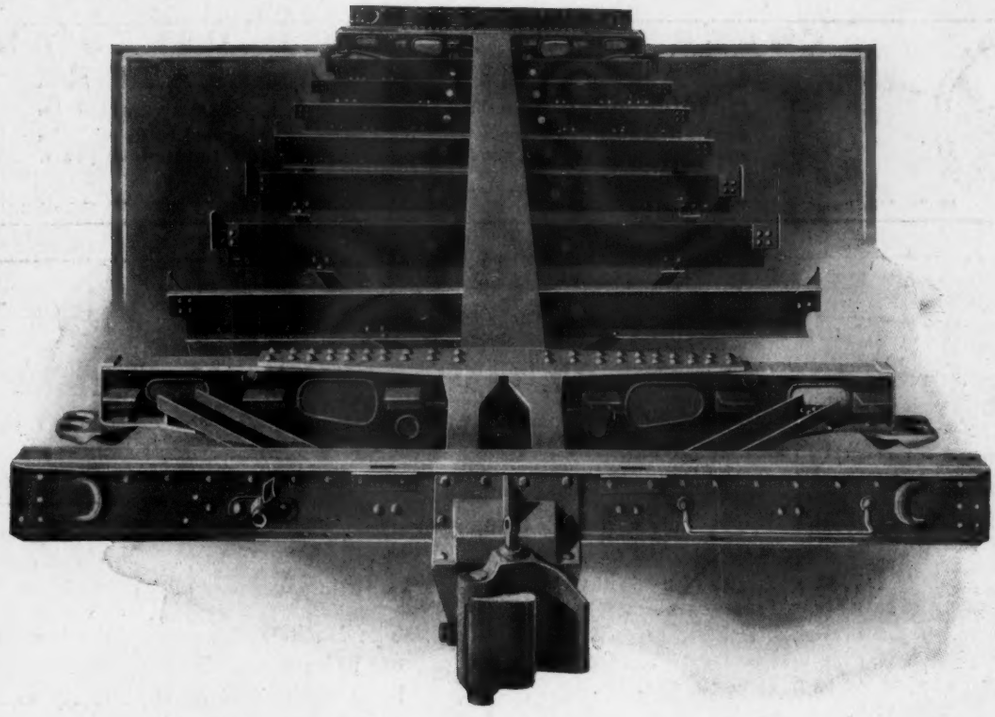

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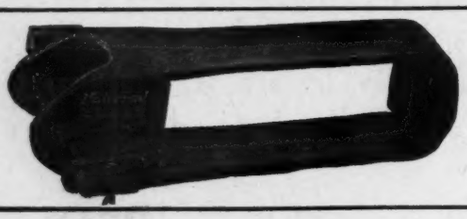

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Railway Age Gazette

Volume 60. May 12, 1916. No. 19.

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The socialists and near-socialists count that day lost whose low descending sun views no new proposal for government ownership of something. They are now advocating government construction and operation of a plant to make armor plate for war vessels. The argument is that this is necessary to prevent private manufacturers, such as the Bethlehem Steel Company, from overcharging the government. Does anybody contend that a government plant would make armor plate cheaper than plants owned by corporations? Nobody who is in his right senses. The proposition is, in effect, that the government shall deliberately lose money in running a factory of its own, in order to prevent private capitalists from making too much money. Government ownership of railroads; of telegraphs and telephones; of steamships; of munitions factories; of coal mines—these are a few of the projects which recently have been seriously broached in Congress. Recently a Kansas educator, who is fully imbued with the spirit of the age, advocated government ownership and management of the moving picture industry. And, meantime everybody is unanimously denouncing the government for the "pork barrel," for not adopting and carrying out a satisfactory program of preparedness, and for general all-around incompetency and cussedness. How logical we are! The worse the politicians do the jobs we have given them the more we want to intrust to them to do! They mismanage the postoffice department; therefore, we should turn the railroads over to them. They waste millions on waterways; therefore, we should give them a chance to waste our money on government owned ships. They mismanage the navy yards; therefore, we should give them armor plate factories to add to the "pork" barrel.

Government Ownership of Everything

The Bureau of Railway Economics has just issued a bulletin thoroughly discussing the proposed legislation to limit the length of freight trains which the brotherhoods of train service employees have been trying so energetically to secure in the various states. A summary of the bulletin is pubished elsewhere in this issue. Its discussions and conclusions have a direct bearing, not only on its immediate subject, but also on another railway topic of pressing current interest, viz., the "basic eight-hour day" for which the train service employees are asking. The bulletin shows clearly that the increases in the average length of trains, which have been the most marked feature of railroad operation within recent years, have contributed greatly toward making railway service both more economical and more safe. The train service employees concede that, with terminals the distances apart that they are now, it would be impossible to get many freight trains over the road within the limits of an eight-hour day without reducing their loads. But to reduce the loads would be to make it necessary to run more trains; and this would have the same effect in increasing the density of freight trains, and thereby augmenting the number of accidents and the cost of railway operation, which the Bureau of Railway Economics shows that train limit legislation would have. In other words, this bulletin of the Bureau, while it does not mention the demands which the train service employees are now making on the managements of the railways, demonstrates in detail and conclusively that to grant the demands and shorten the working day of the train service employees by running freight trains faster and running more of them, as these employees suggest, would be a long step backward in respect of the two most important elements of efficient operation, economy and safety.

Long Trains Promote Safety and Economy

Aside from being the longest railway tunnel constructed in North America up to this time, the Rogers Pass tunnel of the Canadian Pacific now approaching completion is noteworthy because of the unusual methods adopted in its construction. At the time it was first announced that this long tunnel would be driven from a "pioneer" tunnel parallel to and entirely outside of the final tunnel section, various reasons were advanced for the adoption of this method by those not familiar with the plans. Now that the work is approaching completion the success of the unusual method used is evident to all. In an article in another column J. G. Sullivan, chief engineer, states that the entire cost of construction, including the cost of driving 19,610 ft. of "pioneer" tunnel, and the necessary connections to the main bore, will amount to less than $5 per cubic yard of excava-

A Daring Engineering Feat

tion for the main tunnel alone, or about one-half the amount bid by the contractors who proposed to use the methods previously developed in the construction of long tunnels in Europe. This saving in first cost alone is very important. In addition to this the contractors estimated that they would require from 42 to 48 months to complete the work with the old methods. At the present time, when the work has been under way less than three years, the heading is holed through, all drilling for the enlargement has been completed and less than 4,500 ft. of tunnel remains to be enlarged to full section, with steam shovels working in each face. During the month of March, 1916, the steam shovel in one heading alone advanced 1,050 ft. It is evident, therefore, that the tunnel will be completed considerably ahead of the time which would have been required by the contractors using the other methods. If business conditions had continued as expected when this work was undertaken in 1913 and the traffic had continued to increase, this saving in the time of completion would also have been of even more importance than at present. Work such as this illustrates forcibly the fact that there is still opportunity for the development of new methods in engineering construction, and that the romantic days of the construction engineer have not entirely disappeared.

DRIVING WHEEL IMPACT AND LIGHT RECIPROCATING PARTS

THE report of the tests made by the Chicago, Burlington & Quincy on the effect on track and bridges of locomotives equipped with light reciprocating parts as compared with locomotives having reciprocating parts made of ordinary steel, which is published elsewhere in this issue, forms an interesting chapter in the history of locomotive design. While several roads have used special steels in the reciprocating parts of locomotives, no authentic information was available as to just what effect this practice would have on the track until the tests above referred to were made. These tests show that it is of decided advantage to use the special steels of high tensile strength for this purpose. The problem on the Burlington, in the case of its 2-10-2 type locomotives, was to do away with the use of the bob weights on the driving axles, and, in the case of the Pacific type engines, to provide more powerful locomotives without increasing the dynamic effect of the counterbalance on rails and bridges. Both of these problems have been very satisfactorily solved, as will be seen by a study of the results of the tests.

On the 2-10-2 type locomotives with practically no change in the average driving wheel load or in the rated tractive effort, from previous engines, the average impact was reduced from 26.6 per cent of the load on the wheel at a speed of about 41 m.p.h. to 12.1 per cent. The average stress on the girders of the bridge upon which the tests were made, was reduced from 7,318 lb. per sq. in. to 6,530 lb., and the average deflection was reduced from 0.320 in. to 0.288 in. In the case of the Pacific type locomotives, those equipped with the light reciprocating parts have an average driving wheel load of 56,633 lb., or an increase of 5,600 lb., and a tractive effort of 42,200 lb., or an increase of 6,600 lb., over the locomotives with which they were compared. Notwithstanding these increases there was a slight difference in favor of the heavier locomotives in regard to the average stress in the bridge girders and in the deflection, and the average impact was reduced from 34.8 per cent at a speed of about 67 m.p.h. to 21.8 per cent.

The piston load per pound of weight of reciprocating parts on the Pacific type locomotives is 78 lb., which is somewhat less than the corresponding amount for the Pacific and Atlantic type locomotives of the Pennsylvania, which were about the first locomotives in which special attention was given to the matter of obtaining light reciprocating parts, and it is therefore to be assumed that even better results as regards the ratio of the impact to the static load may be obtained than were shown in these tests. In the case of the Burlington it is the belief of the mechanical department officers that still greater improvement can be made.

The results of the tests remove all doubt regarding the advantages of the use of light reciprocating parts, and should serve as a guide for those roads which are seeking to obtain more powerful locomotives for use on track that is, at present, loaded to its capacity.

SENATOR LA FOLLETTE AND THE 16-HOUR LAW

"THERE is so much bad in the best of us"—to say nothing about the good in the worst of us—that it sometimes seems strange that the professional critics of the railways so frequently fail to find the actual facts bad enough to suit their purposes without exaggerating them by several hundred per cent.

One of the most notorious and persistent of such critics is United States Senator Robert M. La Follette. In theApril issue of La Follette's Magazine is an editorial advocating an eight-hour day for trainmen, bearing his autograph signature, which contains the following statement: "The 16-hour law for trainmen afforded some small measure of relief where its provisions were observed, but it has been shamefully evaded. The reports of the Interstate Commerce Commission for the year ending June 30 show that there were 261,332 cases where 16 hours of continuous service was exceeded by train and enginemen."

The year was, of course, omitted for the purpose of implying that the figures given were those for last year. As a matter of fact, they are the figures for the year ending June 30, 1913, according to the report of the commissions, division of safety. In 1914 there were 131,332 such cases, and in 1915 only 59,373, or about one to every five train employees. This is a reduction since 1913 of 77 per cent.

In the *Railway Age Gazette* of February 25 we called attention to a similar statement by A. B. Garretson, president of the Order of Railway Conductors, in a telegram addressed to a labor meeting in New York. It is conceivable that Senator LaFollette did not know what he was talking about, or that he signed an editorial written by someone else equally ignorant, but as the editorial begins with a statement in which he claims credit for the passage of the 16-hour law it seems strange that he should not have followed up its results more carefully. Senator La Follette, however, is engaged in a business in which it is necessary either to fool some of the people all the time or all of the people some of the time. Some people are very easily fooled and most of them do not have the Interstate Commerce Commission's statistics on hand with which to check up all of the misstatements made about railroad affairs. If they did some of our prominent and habitually mendacious demagogues would be looking for new jobs.

Senator La Follette adds: "Each violation involves a crew of five men, hence more than half a million were compelled to work more than 16 hours in continuous service last year." We will not attempt to explain the senator's arithmetic, but the commission's report refers to the number of men, not to the number of trains or crews, and it does not say that these 59,000 men had to "work" more than 16 hours. It does say that *on one occasion during the year* they were "on duty" for more than 16 hours, and that of the 59,000 instances about 32,000 were due to collisions, derailments, track defects or landslides, and were therefore not unlawful. By the same token they can hardly be classed as "shameful evasions" of the law which the senator so regretfully pronounces a failure.

Senator La Follette is either one of the most ignorant or one

of the most untruthful of the many extremely ignorant and untruthful men in this country who mislead the public with discussions of railway matters.

A GREAT RAILROAD COMMISSIONER

THE resignation of Halford Erickson from the Wisconsin Railroad Commission, which took place on May 1, as announced in last week's issue, is a distinct loss not only to the Wisconsin commission, but to railway regulation in general, in which field he has occupied such a distinguished place. As a member of the Wisconsin commission since its organization in 1905, and as its chairman during the past year, Mr. Erickson has come to be regarded as not only one of the most efficient men engaged in railway and utility regulation, but also as one of the fairest and most broadminded.

The Wisconsin commission was created under a law that gave it powers much greater than had been conferred upon any other state railroad commission up to that time, and greater than those possessed by many commissions since that time, although many of the laws under which state commissions are now acting were patterned after the Wisconsin law. The facts that it had such great authority, and that it had been brought into existence by the radical element in Wisconsin politics, naturally caused the commission to be regarded with much apprehension and hostility by the companies which it was to regulate. It was exceedingly fortunate for the state, however, as well as for the railways and utilities, that the commission was given a personnel commensurate in character and ability with its powers and responsibilities, and it was soon given an opportunity, in the state passenger fare case, to show that it intended to follow its ideas of right and justice regardless of popular clamor and political pressure. The original members of the commission besides Mr. Erickson, were John Barnes, who resigned when the state legislature passed a two-cent fare law after the commissioners had decided in favor of a rate of 2½ cents, and B. H. Meyer, now a member of the Interstate Commerce Commission. Mr. Erickson before his appointment had been an active politician of what is now called the "progressive" stamp, but he abandoned politics on taking up the work of the commission and it never has appeared to influence him in the slightest degree in the performance of his duties.

He has had especial charge of the rate-making functions of the commission, which is one of the few that have the power to prescribe absolute, not merely minimum, rates, and under his direction the idea of making rates by mathematical formula based on a valuation of property and studies of the cost of service, has been carried to a high stage of development. Mr. Erickson's methods and theories have often been criticised, but no one has ever disputed the fairness of the purpose back of them; and while he has been one of the foremost exponents of the cost of service theory he has always made much allowance for the commercial conditions upon which railway officers lay so much stress.

While railroad men are inclined to make light of the cost theory of rate-making and to emphasize the value of the service, it is well known that in practice, especially of late years, they have come to depend on cost estimates to a very large extent. It is entirely probable that some of the theories at which they scoff will in a great many cases work out more exactly than some of the so-called more "practical" methods which too often represent guess-work. Moreover, the Wisconsin Commission has not been niggardly in its ideas of a fair return on capital and, having jurisdiction over service as well as rates, has been disposed to prefer good service to cheap service.

If there were more railroad commissioners of the ability, fairness and sturdy independence of Mr. Erickson the policy of regulation would have fewer failures and more successes to its credit.

WHAT ABOUT THE WAGES OF THE LOCOMOTIVE?

ONE of the chief arguments used by representatives of the train employees in support of their demand for higher wages is that because the railroads are now handling freight in much larger train loads than formerly "the freight train crew of the present time is moving a much greater amount of traffic than the crew of 10 years ago."

The unsoundness of the theory of "productive efficiency," as used by the pseudo-economists of the labor organizations, was demonstrated in the *Railway Age Gazette* of April 14, but the argument is stated in a new way in an article in the May number of The Railroad Trainman, issued by the Brotherhood of Railroad Trainmen, which publishes a series of tables from the statistics of the Interstate Commerce Commission to show the increases in the tractive power of locomotives, in the capacity of freight cars, in the tonnage per train, etc. From these statistics, it says, "it is possible to secure definite information as to the amount of work done by train employees." It has been generally understood that the locomotive did most of the work of hauling freight, but, according to The Railroad Trainman, the power of the locomotive is merely "a good index of the greater amount of work performed by the train employees."

Therefore it gives a table showing the increase in the average tractive power of locomotives from 22,804 lb. in 1904, to 30,420 lb. in 1914, or 33.4 per cent. Another table shows that the average train load of freight increased from 307.8 tons in 1904, to 451.8 tons in 1914, or 46.9 per cent. The article does not state whether it is intended to imply that the locomotive loafed on the job in 1904 and did not work to full capacity, or that the members of the train crew got out and pushed in 1914 in order to move the larger trainload, but it does say that "each freight train crew carried nearly one-half as much again in 1914 as in 1904." If this were correct no one would dispute that its members should be paid for it. The article implies that they have not been, because it is profoundly silent about any increase in wages since 1904, either for the men or for the locomotive.

One of the unfortunate conditions to which the railroad business is subject is that neither the men nor the locomotive can be paid until the shippers pay the freight rates. However, the shippers have a few ideas of their own regarding the distribution of the results of productive efficiency. They are not so well organized as the train employees, but they have been able to look after themselves pretty well on the whole, and during the 10 years under consideration they have got the average rate which they pay to the railroads for hauling a ton of freight one mile reduced from 7.8 mills to 7.33 mills. As a result, while the 307-ton train of 1904 produced a revenue of $2.42 per mile the 451-ton train of 1914 earned $3.30 a mile, an increase of only 32.2 per cent. For an increase of 46.9 per cent in tonnage, therefore, the railroads got an increase of 32.2 per cent in revenue.

Some of the train crews were engaged in handling passengers instead of tons of freight. Either they or the locomotive carried 46 passengers per train in 1904 and 56 in 1914, an increase of 21.7 per cent. The revenue per passenger train mile meanwhile increased from $1.14 to $1.34, or only 17 per cent. The revenue per freight and per passenger train mile may be called the wage of the locomotive. Out of it must be paid the wages not only to the train crews, but of the traffic department that got the traffic to put in the cars, and of the men who keep the track in condition to run trains on, and of the entire railroad organization. How did these wages increase?

In order to be fair to the railroads The Railroad Trainman quotes its Interstate Commerce Commission statistics from the handy little volume entitled "Statistics of Railways, 1904-1914," published by the Bureau of Railway Economics.

This same handy volume also contains tables showing that in 1904 there was paid to 253,834 enginemen, firemen, conductors and other trainmen $229,081,727, an average of $902.09, and that in 1914 there was paid to 309,174 enginemen and trainmen $387,511,508, or an average of $1,253.37. This is an increase of 38.9 per cent in the average wage per year.

The wages of the train crews did not increase so fast as the number of tons of freight per train, but they increased faster than the number of passengers per train. Moreover, these men do not collect their wages in tons; they insist on dollars, and their wages have increased considerably faster than the dollars available to pay the wages. As a result there has been less left to pay the wages of the other employees, whose average pay from 1904 to 1914 increased only 25.5 per cent. The train crews therefore have done pretty well, even if they, instead of the locomotive, have been moving more freight.

However, it has been commonly understood outside of labor circles that it has required a considerable amount of brains, technical skill, perseverance, industry and capital on the part of locomotive designers and builders to make a locomotive capable of hauling more, and on the part of the railroad managements in reducing grades, strengthening bridges and otherwise improving their facilities to enable them to accommodate longer and heavier trains, as well as a great deal of planning and supervision to make the locomotives haul somewhere near their capacity. It is admitted that on principles of social justice all of the benefits from the increased efficiency of a machine, or of a plant as a whole, should not go to the inventor or to the capital that made the invention commercially useful. It should be shared with the employees in the form of higher wages and better working conditions, and with the public in the form of reduced prices or better service. In the case of the results of increased railroad efficiency the public has received a share in the form of lower freight and passenger rates and better service, labor has received higher wages, shorter hours and better working conditions, but where is capital's share? The average return on the capital invested in railway property has been reduced from 4.99 per cent in 1904 to 4 per cent in 1914. The wages of the locomotive have been reduced, while the men who ride on or behind it have received the largest share of the product of its work. These facts hardly justify a still further increase in their wages.

NEW BOOKS

Oxy-Acetylene Welding and Cutting, Electric and Thermit Welding.—By Harold P. Manly. Bound in cloth. 209 pages, 4¼ in. by 6¼ in. Illustrated. Published by Frederick J. Drake & Company, Chicago.

This book should prove of value to anyone concerned in metal working. Its size has been kept small but the range of subjects and the details covered is very complete. The chapters include discussions of the heat treatment of metals; welding materials; acetylene generators; welding instruments and a general discussion of the practice in both oxy-acetylene and electric welding. There are also chapters devoted to hand forging and welding as well as soldering, brazing and thermit welding. The illustrations are particularly clear and show the various types of equipment in considerable detail.

Locomotive Engine Running and Management.—By Angus Sinclair. Bound in cloth. 428 pages, 5 in. by 7½ in. Illustrated. Published by John Wiley & Sons, Inc., New York. Price $2.

This is the twenty-third edition of a book which has been most favorably known in railroad circles since 1885. There are many successful railroad men who obtained their first knowledge of the locomotive and its management from this book, and it is a most valuable work for anyone concerned in the operation of locomotives. In this edition the book has been thoroughly revised and brought up to date and the author states that it is now practically a new book.

Letters to the Editor

SAFETY SUGGESTIONS FROM EMPLOYEES

CHICAGO, ILL.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have been very much interested in the communications which have been published in the *Railway Age Gazette* emanating from members of various safety committees, making suggestions as to what they think should be done in the way of calling attention to dangerous conditions and practices.

In your issue of March 3, page 403, is a communication from a chief clerk, in which it is suggested that the companies ought to invite their employees to make reports and suggestions which would bring about greater safety and regularity. Possibly the readers of your magazine, especially those connected with the safety first movement, might be interested in the bulletin which this company got out on November 16, 1915, and sent to all employees on the system, asking them to make suggestions and reports and telling them where they could get the postal cards on which to do it. They were told, also, that no man would be disciplined who was reported the first time.

We have also had printed on our pay checks and pay envelopes—I think three times—a notice to the same effect.

R. C. RICHARDS,
Chairman Central Safety Committee, Chicago & North Western.

SELECTING PASSENGER TRAINMEN

NEW YORK CITY.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I have read with great interest the editorial in your issue of February 11 on "Comforting Delayed Passengers" and also other articles in various issues bearing on the same subject. It is not only the big things which make life move along smoothly and pleasantly, but it is also the little things which come to each one of us, day by day. You touched the vital spot when you say "The trouble is in the last word—frequency." In other words, it is the little things which confront us frequently, to which attention should be given.

As trainmaster of one of our large railroads, I employ young men between 18 and 21 years of age, for the position of assistant baggage agent at our local stations in a heavy suburban territory on the main line of the road. These young men are chosen, first, for their fitness for the position as an assistant baggage agent, and, second, as to their fitness for promotion into the passenger train service. They must at least have a grammar school or high school education, be not less than five feet and eight inches in height, and pass a strict physical examination; and last, but not least, their habits must be good. If it is a question of deciding between two applicants, one who shows by the expression of his face, that he has a sunny disposition and who speaks in a pleasant manner, as against another who shows that he is inclined to be grouchy, and also shows by his conversation, that his tone and manner would antagonize our patrons, the former is always chosen.

One of the first lessons taught them is politeness and courtesy to our patrons, and to one another, as we feel (and it has proved so in actual service on our division) that one of our greatest assets is the uniform politeness and courtesy of our trainmen shown to the traveling public, and their willingness to assist, in any way, those with whom they come in contact. In other words, the Golden Rule is set forth as making for courtesy and all that that word implies; and our second rule is the well known 106 of the book of rules, "In all

cases of doubt or uncertainty, assume no risk but take the safe course," which makes for safety.

All the rest of our training is built up on these two rules. If every employee would put himself in the other fellow's place when the frequent little things turn up daily, either on the train, or at the ticket window, or in any other department where the employee may be, these complaints from the public would to a large extent be eliminated, and possibly the revenue increased. E. P. B.

HEAVIER LOADING OF CARS

PITTSBURGH, Pa.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The great shortage of cars that the shipping public is afflicted with generally throughout the country is especially acute in the greater Pittsburgh district today. It is interfering with the operation of blast furnaces, steel works, and mills generally, and with the early approach of the opening of navigation on the lakes, when the number of cars required to handle the greatest movement of iron ore that the country has ever seen will be extraordinary, the car supply will be a very serious problem. The increased volume of traffic offering today has far exceeded the most advanced plans of the railroads to provide facilities for the natural increase.

Some people look upon the present demands upon the railroads as abnormal and the heavy volume of traffic as a movement of a temporary character, while, as a matter of fact, the periodical boom in business that takes place in this country every decade, with more or less regularity, was a little late this time and was naturally stimulated by the European demand. There can be no question but what the business has come to stay. . . .

Throughout this vast country there are thousands of concerns that are trying to supply something or other for Europe at very high prices, and the conditions of sale are f.o.b. cars at point of shipment, so that as soon as a minimum carload is loaded and the bill of lading issued, the bill is taken to the bank and the shipper gets his money; he cares very little about what becomes of the shipment or when the real consignee gets it. In other words, the embargoes that have been placed by the eastern Trunk Lines are only enforced because the shipping public has attempted to use freight cars as store houses.

There is another peculiar thing about the embargoes that have been placed and are in effect today; they do not apply to less than carload shipments, the most unremunerative traffic that the railroads have. Less than carload shippers can keep on contributing to congestion and the abuse of cars right in the midst of the embargoes that are placed to relieve the situation.

If the railroads throughout the West could take up the question of embargoes and absolutely stop the promiscuous loading of cars until definite arrangements had been made at the seaboard for exporting the specific shipments, there would be a chance for the ships that are sailing from New York to go forward with full cargoes instead of sailing as they are compelled to do today, frequently with only part of a load.

In other words, it is the heavier loading of cars that everybody should be interested in. It is gratifying to state that twelve shipping companies of the United States Steel Corporation during the year 1915 showed an average carload of 77,000 pounds per car, increasing the average carload on outbound shipments during the year 1915 1,800 pounds per car, effecting an actual saving of 26,583 cars, as compared with the loading for the year 1914, when the average was 75,200 pounds per loaded car.

It might appear at first as though the adoption of larger cars was responsible for this great showing, but there was very little change in the capacity of cars in the two years that are compared; it is rather the result of a persistent determination to utilize all cars to their fullest capacity. During the last four years, the same twelve companies have effected a saving of 165,696 cars through heavier loading.

The shippers, consignees, and the railroads have been greatly benefited in the smaller number of cars switched and weighed, to say nothing of the great saving in operating expenses. There is a pronounced money value in conserving freight car equipment, not only when there is a severe car famine, but at all times.

J. F. TOWNSEND,
Traffic Manager, Nationl Tube Company.

SUGGESTED AMENDMENT OF THE HOURS OF SERVICE ACT

ILLMO, Mo.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Section 2 of the hours of service act clearly defines the number of hours that employees may be permitted to remain on duty, but fails in its provisions to require that employees when off duty take needed rest, etc.

Section 3 imposes a penalty upon the carrier for permitting employees to remain on duty in excess of a prescribed time.

I believe that this law which places the entire burden upon the carrier, with no requirements upon the employees, fails in its purpose to bring about the degree of safety intended.

During the nine years in which this law has been in effect it has on numerous occasions come to my notice that a percentage of employees who come under its provisions fail in many instances to take the absolute rest while off duty needed to fit them for a resumption of watchful, intelligent service. The failure of employees to take needed rest has much to do with acts of negligence, which are the usual causes of accidents where personal injury, loss of life and property results.

I believe employees who have to do with the movement of trains should be held strictly accountable for their acts, and that this law should be so changed to bring this about.

The marine laws very properly require the master and pilot of a vessel or boat to present themselves before the government board of examiners and to pass a satisfactory examination covering the duties they are required to perform, and a license is issued to such employee, master or pilot. No person not thus authorized is permitted to take charge of a vessel or boat as master or pilot who has not qualified for service as above outlined.

The requirements of the federal government in regard to the operation of a railway are many. The employee who violates the government requirements is in all cases exempted by the government from any responsibility. The arrogant, threatening attitude of the several labor unions against the railways in all cases where railways attempt to discipline employees responsible for violation of the several laws, rules and regulations is of a character that the railways frequently are restrained from disciplining employees at fault, in the interest of harmony and to prevent a strike.

I believe that the interests of all concerned would be better served by requiring employees to have a license, issued by the authority of the government, authorizing them to act in their several capacities, and that the employees should be classified, the first class to include train despatchers, locomotive engineers, conductors and operators, and the second class to include flagmen, brakemen, yard foremen, switchmen, firemen and signal operators.

I would further recommend that licensed employees desiring to leave the service be required to give the carrier 30 days' notice, and that all cases of difference as to wages and conditions of service between employees and the employing carrier should be required to be taken up by the employee

with the carrier for a decision and settlement. If the employees were not satisfied with the decision the matter could be referred to arbitration. Any employees failing to comply with these requirements should suffer the cancellation of his license.

Only employees bearing the endorsement and recommendation of the employing carrier would be eligible for qualification under this act.

For emergency cases it might be provided carriers may employ for a period of 180 days any person whom the carrier regards as competent to fill any position as set forth in the act without a license, but should require such employee to present himself for examination as quickly as practicable within the time as above outlined. In all cases of accident brought about by negligence of employees resulting in personal injury, loss of life or property, the carrier should be required to furnish a transcript of the record of an investigation with its recommendations to the federal examiners.

Upon satisfactory proof being furnished by the carrier the license would be taken up from any employee guilty of: use of intoxicants; failure to observe and comply with signals; failure to properly display signals, resulting in danger to trains; failure to take needed, absolute rest, or of promoting or engaging in a strike.

F. S. STIMSON,
Assistant Superintendent, St. Louis Southwestern.

THE FUNCTION OF THE DISTANT SIGNAL

EAST COFFEYVILLE, Kan.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

In his letter on "The Function of the Distant Signal," in your issue of May 5, "A Standard Code Man" argues that an engineman cannot always take the same action under the indication "Proceed with caution," but "must instinctively make the distinctions necessary for the safe movement of the train according to the existing local conditions." And "there is no requirement in the wording recommended by the minority as to the speed to be observed by the engineman when acting on the indication 'Proceed with caution,' and it must be assumed that this is left entirely to the engineman." It is, in his opinion, "to the practical operating man better that the action to be taken by the engineman be clearly prescribed by the indication rather than to leave these distinctions to the intuition of different enginemen."

He then implies that the action to be taken or speed to be run by the engineman is "clearly prescribed" by the following indications of the Standard Code: Approach next signal prepared to stop. (Approach-signal, Block unoccupied.) Approach home signal with caution. (Caution-signal, Block may be occupied.) Proceed at slow speed prepared to stop short of train or obstruction. (Permissive-signal, Block is occupied.)

But a careful reading fails to justify this claim. In only one of the three is anything said about speed. It is to be supposed that they are intended to prescribe different kinds of action, but it is hard to see how they *prescribe the action to be taken* any more clearly than does "Proceed with caution." It is particularly hard to see what difference of action is intended when a train approaches next signal prepared to stop and approaches home signal with caution. A fourth indication seems to belong in the same group: Proceed with caution prepared to stop short of train or obstruction. (Permissive-signal, Block is occupied.) Again we find nothing about speed. To act properly under these four indications it would seem that the engineman must still "instinctively make the distinctions necessary for the safe movement of the train according to the existing local conditions"—distance to the next signal, extent of view, grade, speed of train, etc.

We are certainly indebted to "Standard Code Man" for his clear statement of the difference of conditions on which one intended difference of action may be based. It is not invariably the case, of course, that the block *is* occupied when the permissive-signal is displayed. But, leaving that quibble aside, will any railroad officer agree that an engineman should take different action when the "block *is* occupied," from that which he should take "for the safe movement of the train" when the "block *may be* occupied"?

The rule desired, it is said, after the investigation of the Milford collision, "was one that will require enginemen to run their trains at such speed that clear signals will be received and an approach or caution signal shall not be successively passed at normal speed." But what better way is there to bring this about than to make it the universal requirement that a "train should immediately slacken speed upon receiving the first caution signal," just as the Milford report recommends? It is fair to assume that the recommendation was based, not solely on the circumstances of this case, but quite as much on the records of numerous other accidents, not specially reported; and that, in many of these cases, there was a strong probability that the practice recommended would have had a good effect. In the Milford case, moreover, "the evidence seems to justify the conclusion" that several caution signals had been passed. If the engineman had reduced speed at the first of these, the collision would undoubtedly have been prevented.

It is true that "the recommendations of the Milford report are to the effect that an additional rule be prescribed, but not that the Standard Code should be changed." A change is not recommended in terms. It would be well, however, not to overlook the hint contained in the following: "Under the present practice of the New Haven Railroad, the distant signal at caution indicates to the engineman that he should prepare to stop at the next signal. This is practically the same as the standard code of the American Railway Association for three-position signaling. This is not as definite and clear-cut a rule as that given for the indication of the home signal, which says 'stop,' leaving in the latter case nothing to the discretion of the engineman."

Probably no one will claim that "Proceed with caution" distinctly says "slow down at once." The action to be taken is, of course, a matter of instruction, training and experience; and long before a man becomes an engineman he knows very well what is required. If prompt slowing down is required, however, this indication is better than one that talks about the next signal; and most certainly it is better than three or four imaginary distinctions that add nothing to clearness.

A CODE RECONSIDERATION MAN.

A CORRECTION

CHICAGO, Ill.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

My attention has been called to a paragraph under the heading, "Supply Trade News," on pages 973-4 of the *Railway Age Gazette* for April 28 last.

It is there stated that the types of arch which the Universal Arch Company (formerly the National Arch Company) has placed upon the market "have been passed upon and accepted" by this association. In view of the wide circulation of your paper, I cannot allow this unauthorized statement to pass without correction, lest our members be misled. With one exception, this association has held that the arches, so far as known to us, offered by the Universal company infringe prior patents and can only be used, if at all, under bond.

Please understand that I am not criticizing the *Railway Age Gazette* nor its editors, who cannot be expected to know everything this office does, but if your custom permits it I would be much obliged if you would publish this letter.

GEORGE S. PAYSON,
General Counsel, Western Railroad Association.

A New Ohio River Bridge at Metropolis

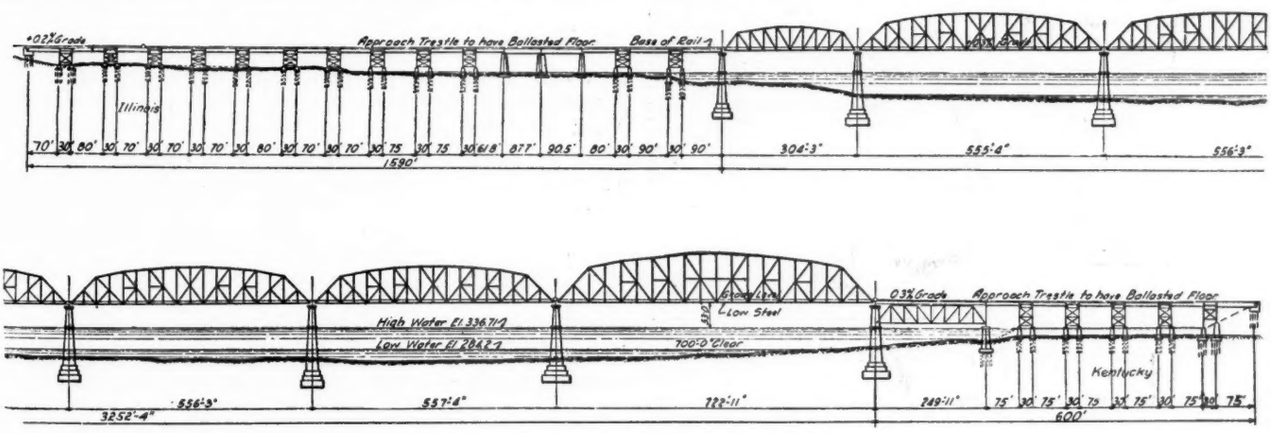
Work on Approaches and Substructure Is Far Advanced; Erection of River Spans Will Be Started Soon

Floating the Caisson Out of the Pontoon.

MATERIAL progress is being made on the construction of the bridge over the Ohio river at Metropolis, Ill., which is being built by the Paducah & Illinois Railroad, a corporation controlled jointly by the Chicago, Burlington & Quincy and the Nashville, Chattanooga & St. Louis. The present season will probably see the completion of all of the substructure and the erection of both approaches and three of the river spans.

The most notable feature of this bridge, the general details of which were outlined in the *Railway Age Gazette* of July 23, 1915, is a span 720-ft., which will be longer by 45 ft. than any simple span previously erected. This will extend over the channel of the river, which is located near the Kentucky shore, with only a single span of 249 ft. 11 in. between the channel and the south approach viaduct. North of the long span there will be four of 557 ft. 4 in. and one of 304 ft. 3 in., all through truss spans. The north approach consists of 1,590 ft. of steel viaduct and the south approach of 600 ft. of viaduct. The track on the channel span will be on a level grade 113 ft. above low water with 0.3 per cent grades descending on each side. The difference between high and low water stages is 52.7 ft., providing a clear head room under the bridge at high water of 53 ft.

During the past year the north approach viaduct has been entirely completed. The substructure for the south approach has also been finished and the erection of the superstructure is now in progress. Work on the piers for the main spans, involving the use of the pneumatic process, has been under way for about a year. Three of the piers have been brought to bearing and their caissons sealed and the sinking of two of the others is well under way.



Elevation of the Metropolis Bridge

The Bridge Substructure

The river piers are founded on a thick stratum of white quartz sand 75 ft. below the low water level. Foundations on rock are out of the question as the rock is 230 ft. below the low water elevation. With bearing pressures suitable for sand foundations, the footings for the piers are of the spread

type with pronounced offsets at their connections to the shafts of the piers. This condition necessitated a material departure from usual practice in caisson design.

The stage of the Ohio river has been unusual during most of the time that the work has been in progress, the water level being abnormally high during seasons of the year when the river is ordinarily at a relatively low stage. This situation has tended to upset the calculations as to the anticipated progress of the work, although the original program of construction is practically unbroken.

Pier No. 1 on the Illinois side is complete. Work is in progress on pier No. 2 and the caisson has been sunk to within about 45 ft. of the required depth. Pier No. 3 had been carried to within 16 ft. of the bottom when the work had to be discontinued on account of high water, which was creating a head of 90 ft. over the working chamber. Piers Nos. 6 and 7 have been landed, the chambers sealed and the work on the shafts is well above the water line. In the case of pier No. 6 the water was 100 ft. deep over the working chamber when the sinking was completed. The Union Bridge and Construction Company, Kansas City, is the contractor for the seven river piers.

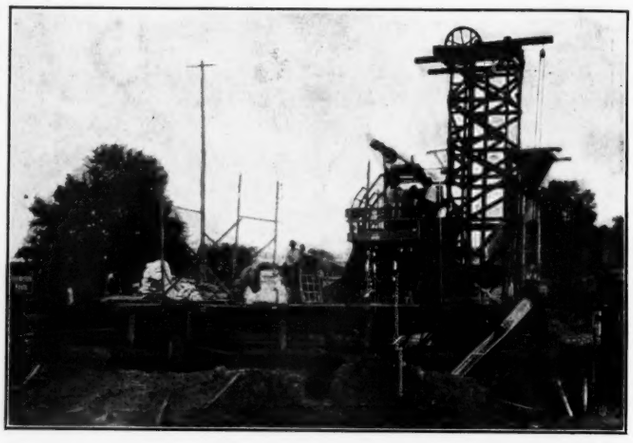
The Approach Viaducts

The approach viaducts consist of 30-ft. tower spans with 75-ft. clear spans in the south approach and clear spans varying from 62 ft. to 90.5 ft. in the north approach. At one place in the north approach the steel towers are replaced by solid masonry piers to full height, serving as the intermediate supports for four girder spans varying from 61.8 ft. to 90.5 ft. in length. One of the piers is on a skew. This modification of the standard viaduct design was necessary to carry the structure over railroad tracks occupying the surface below.

Pedestals for the North Approach Viaduct

In all other cases the viaduct towers are supported on relatively low concrete pedestals of cylindrical section with a top diameter of 6 ft., the sides having a batter of 1 in. per ft. These pedestals are reinforced by hoops of ½-in. bars spaced 2 ft. center to center and ¾-in. vertical bars having the same spacing. Grids of ¾-in. bars spaced 12 in. center to center in two directions serve as reinforcement for the tops. The pedestals north of the three viaduct piers mentioned above are on natural foundations with footings 17 ft. in diameter and 3 ft. 6 in. thick. They are reinforced with grids of reinforcing bars at the bottom, laid in four directions 6 in. center to center. The pedestals located below the high water line are carried to gravel foundation at a considerable depth below the ground surface. The others are founded on hard clay mixed with gravel, below the frost line. The pedestals for the two towers just north of the river and all those in the south approach are supported on reinforced concrete piles, 20 and 30 ft. long, 700 piles being required in all.

The substructure for the approaches was put in by the railroad company forces. The concrete for the pedestals for the north viaduct was provided by a ⅓-cu. yd. Ransome mixer mounted on a 100,000-lb. capacity steel-frame flat car and equipped with a power charger and a steel tower and spouting. This mixer was operated by a motor using 2,200-volt alternating current, purchased from the city of Metropolis, which provided a transmission line along the entire length of the north viaduct so that power could be taken by the car from any point along the track laid beside the viaduct. Tennessee river bar-run gravel was used for the concrete aggregate. It was delivered to Metropolis in barges, from which it was transferred to open-end gondola cars by means of a derrick and bucket, eight cars being kept in this service during the work. Blaw steel forms were used for the neat work of the pedestals. These forms consisted of No. 16-gage sheets turned up to provide flanges, keyed together and braced by sectional rings made of flat steel bars.



Concreting Car Used for the Pedestals of the North Approach

The concrete piles are of the cast and drive type and were concreted on the north river bank in a yard located on either side of a track from which the concreting could be carried on from a mixer car.

The Superstructure

Aside from the use of a span of unusual length, the superstructure of the river bridge involves a departure from usual practice in the use of a much higher live loading than that actually existing at the present time, in conjunction with high unit stresses. This idea has been discussed at some length previously and has the object of securing a more uniformly balanced design under a condition of actual loading materially in excess of those now obtaining. Silicon steel is used in all the main members of the trusses except the center verticals and the eye-bars. Nickel steel is used in the eye-bars and pins, and medium steel in all the sub-posts and diagonals, the center verticals and the floor system.

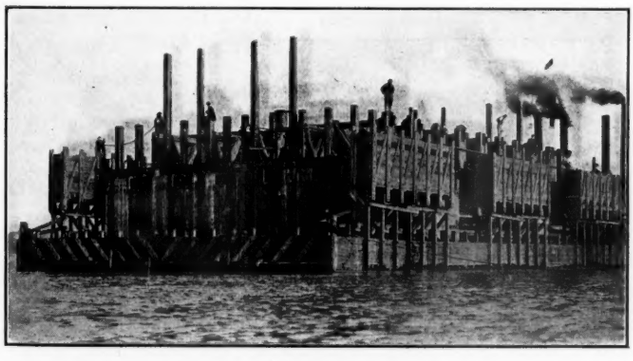
The live loading assumed in the design of the trusses consisted of two Cooper's E-90 engines followed by a uniform load of 7,500 lb. per ft. of track on the near track, with a uniform load of 7,500 lb. per ft. on the far track, except in

the case of the floor, hangers and sub-diagonals where the E-90 loading was applied to each track. Impact was taken into account by adding an additional 10 per cent of the live load to all members except hangers and sub-diagonals and the web members of the 249-ft. and 304-ft. spans. On the latter 20 per cent was added while in the floor, hangers and sub-diagonals the impact percentage was 50 per cent of the live load for one track. The unit stresses in medium steel, silicon steel and nickel steel for tension and bending were

Top View of the Caisson for Pier No. 1, Showing Heavy Framing

20,000 lb., 30,000 lb. and 35,000 lb. per sq. in. respectively under dead load, full live load and impact load. The contract for the structural steel, including erection, was let to the American Bridge Company, and the steel is being fabricated at the Gary plant.

Silicon steel was selected for the main compression members of the river spans because of the saving of material and dead load afforded by the higher unit stresses permissible with its use in place of high carbon steel. This decision was based upon comparative estimates with various classes of

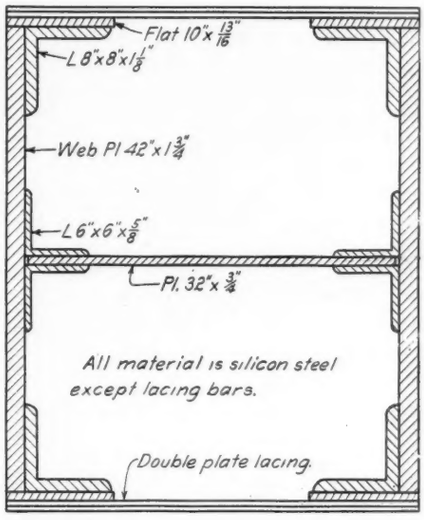


Caisson Being Floated Into Position in the Pontoon

steel, which indicated an advantage of about 2,000 tons for the silicon steel. The total weight of the bridge, including the viaduct, is estimated at 16,000 tons, of which about 3,300 tons will be in the approaches and 3,700 tons in the long span.

The 720-ft. channel spans and the four 557-ft. spans are of the same type and detail, being through Petit trusses providing for two tracks spaced 13 ft. center to center with 8-ft. side clearance and 22-ft. vertical clearance above top of rail. The long span is 110 ft. high center to center of chords at the center panel point, and it is made up of 20 sub-panels 36 ft. long, center to center of pins. Although the trusses are pin-connected there are simple pin joints in the top chord only at the hips. The second joints in the top chord are combination pin and riveted joints and all the others are full riveted joints, stiff main diagonals being used in the fourth and fifth panels. With the exception of the latter and the first panels of the bottom chord, all main tension members are nickel steel eye-bars, the maximum size being 16 in. by 1-15/16 in. on 14-in. pins.

An interesting feature of the design is the shape of the main compression members, which are of an H-section, as shown in an accompanying drawing. The webs are 42 in. deep, with a maximum thickness of 1¾ in. The diaphragm plate varies from 32 to 33 in., with a uniform thickness of ¾ in. The diaphragm angles are 6 in. by 6 in. and the flange angles are 8 in. by 8 in. Ten-inch flats are used on the top chords and end posts but are omitted in the intermediate posts. The end posts have double webs in the lower panel of a total thickness of 2⅛ in. The section is reinforced with heavy lacing on both sides. This section was adopted after a series of one-half full-size tests on mem-



Typical Section of Top Chord of 720-Ft. Span

bers of similar and modified design made up in several kinds of steel.

The use of this type of section introduced a problem because of the absence of the usual cover plate which has served incidentally as a protection against accumulations of snow, dust, dirt and moisture. This has been solved by provision for covers for the end posts and top chords made up No. 13 gage sheet metal to be built in short sections to permit of convenient removal for painting and inspection.

The span was designed for an erection camber of 13 in. The calculated increase in length of the span occurring with the removal of the false work, or application of the dead load, is 5⅜ in., and to allow for this in the stringers, expansion pockets have been provided in the floor beams at four points in the length of the span to receive the stringers.

The design and construction of this bridge is proceeding under the direction of C. H. Cartlidge, chief engineer of the Paducah & Illinois and bridge engineer of the Chicago, Burlington & Quincy, all plans and specifications being approved by Ralph Modjeski, consulting engineer, Chicago. The construction is under the immediate direction of C. R. Fickes, resident engineer, and the plans have been prepared under the immediate direction of A. Engh, office engineer.

RAILWAY WAGES IN 1915

Twenty-two classes of railway labor earned an average of over $1,000 in the year ended June 30, 1915, according to the annual report of the Bureau of Railway News and Statistics, Chicago, just compiled. The average for all employees was $825, by a wide margin the largest ever attained. Total compensation to labor in 1915 was over $265,000,000 more than the sum paid in 1909, although at the end of June, 1915, there were over 22,000 fewer employees on the pay-roll than in 1909. A statement issued by the Bureau says:

"The Bureau's annual resume of railway labor, based on reports identical with the reports to the Interstate Commerce Commission, is the first compilation of railway labor statistics under the revised forms inaugurated by the commission in 1915. For 23 years the United States has had the most complete record in the world covering numbers, days of service and compensation of 18 classes of employees. The revised scheme calls for 68 classes in service, every two months, the average number for the year, total hours on duty for each class and total compensation paid each. Substitution of hours for days worked and adoption of the average number employed for the year in place of the number on June 30 is regarded as a great improvement, but there is a distinct loss in the break in continuity rendering difficult, and in some respects impossible, comparisons with former years.

"The new classification affords for the first time an accurate statement of average yearly wages per employee, and also the yearly wage of each class.

"Excepting only general officers, $3,000 per annum and upwards, and division officers, $3,000 per annum and upwards, it is shown as a result that the highest annual earnings in the entire 68 classes are among the trainmen's groups, now united in a demand for 10 hours' pay for eight hours' work, with time and one-half thereafter, which would mean 25 per cent additional pay per hour straight time and 87½ per cent additional after the eighth hour. The averages for the trainmen classes are:

	Average pay per year		Average pay per year
Engineers—		Conductors—	
Road passenger	$2,041	Road passenger	$1,766
Road freight	1,792	Road freight	1,537
Yard	1,464	Yard	1,303
Firemen—		Brakemen, yard	1,127
Road passenger	1,229	Brakemen and flagmen—	
Road freight	1,087	Road freight	994
Yard	878	Road passenger	978
		Other road trainmen	825

"Against the incomes of some of these aristocrats of the labor world, general officers below $3,000 per annum average only $1,574; division officers below $3,000 per annum, $1,690; train despatchers and directors, $1,529; general foremen M. E. department, $1,521; foremen M. W. department, $1,075; yard masters, $1,528, and station masters and assistants, $1,323. The highest group of general officers and division officers alone, with $6,099 and $3,667 respectively, exceed the attainments of the again restless trainmen. In 20 years engineers' pay has risen from $3.61 to $5.24 per day, or over 45 per cent; firemen's from $2.03 to $3.22, or over 58 per cent; conductors' from $3.04 to $4.47, or over 47 per cent, and other trainmen's from $1.89 to $3.09, or over 63 per cent.

"The effect is shown in the almost unbroken growth in the portion of railway revenues consumed by wages. The rise in ratio of wages to expenses is not so marked, since other expenses as well as wages have made rapid strides. Both ratios show a decline in 1915 because of a drastic reduction in employment. In 15 years of every dollar revenues and expenses the sum going to wages has grown thus:

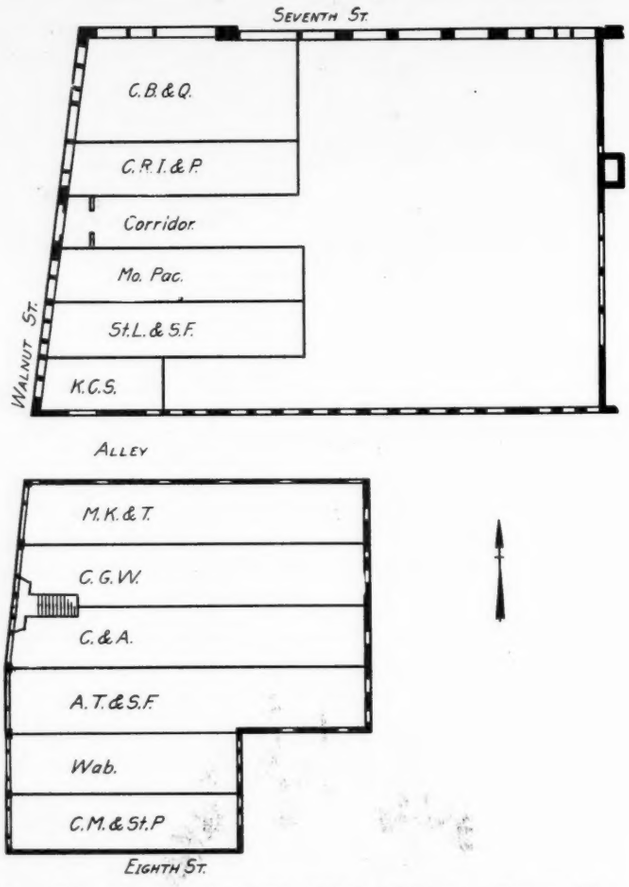
	Of each $1 revenue	Of each $1 expense
1915, for wages	43.20 cents	61.33 cents
1914, for wages	45.09 cents	62.37 cents
1910, for wages	41.82 cents	62.75 cents
1905, for wages	40.34 cents	60.40 cents
1901, for wages	38.39 cents	59.27 cents

"As already stated, the wage ratio in 1915 fell because of the reduction in forces due to the business depression.

"Not since 1908 have there been fewer reported in railway employ than the 1,506,433 in June, 1915. In June, 1909, there were 1,528,808, and in June, 1913, 1,864,303. The average number for 1915 was 1,542,209."

CENTRALIZED TICKET OFFICES IN KANSAS CITY

As briefly noted in our issue of March 10, eleven of the principal railroads entering Kansas City have adopted a plan for centralized city ticket offices. These offices will be concentrated in a new location on Walnut street, between Seventh and Eighth streets. The Walnut street side of the present Midland building will be remodeled and a four-story building will be erected south of it, which will accommodate the offices of four roads, so that all of the eleven roads will have parallel offices facing on Walnut street on the first floor. At present the ticket offices of the roads are scattered throughout the business district. The new location is very convenient to the public, and will result in a very considerable reduction in the present rents.



Floor Plan of Centralized City Ticket Offices at Kansas City

The leases for the new location have been prepared but it is not likely that the roads interested will move into their new offices before September, because of the alterations which will have to be made and the erection of a new building to accommodate four of the interested lines. The accompanying floor plan shows the arrangement of the offices in the two buildings. The Union Pacific has not entered into the plan for the centralized offices but will keep its present location at Ninth and Walnut streets.

Locomotive Impact Tests on the Burlington

Study of Benefits to Bridges and Track Derived by Use of Light Reciprocating Parts on Locomotives

By C. B. Young
Mechanical Engineer, Chicago, Burlington & Quincy

Running Gear of Santa Fe (2-10-2) Type Locomotive.

THE Chicago, Burlington & Quincy purchased seventeen 2-10-2 type locomotives in 1914 and 1915, and 15 Pacific type locomotives in 1915, which were built with reciprocating parts made of special heat treated steel in order to reduce the amount of counterweight ordinarily required to balance these parts. Last September impact tests were conducted on a three-track 63-ft. plate girder skew span bridge to determine the effect these locomotives had on bridges and track in comparison with locomotives of approximately the same size and design with reciprocating parts made of ordinary steel. In making the tests the railroad company was assisted by W. S. Kinne of the University of Wisconsin, who has had considerable experience in tests of this nature.

Description of the Locomotives

Four locomotives were used in the tests, two of the 2-10-2 type and two of the Pacific type. The locomotive of the 2-10-2 type provided with the special heat treated steel reciprocating parts is designated as M-2-A and the other having the ordinary steel, as M-2. Similarly, S-3 designates the Pacific type locomotive having the special heat treated steel reciprocating parts and S-2 the locomotive of the same type using the ordinary steel for these parts. Both of these types have been described in the *Railway Age Gazette,* the 2-10-2 locomotives in the issue of August 13, 1915, page 275, and the Pacific type locomotives in the issue of August 28, 1914, page 387. They are of the following general dimensions:

	2-10-2		Pacific	
Class	M-2A	M-2	S-3	S-2
Reciprocating parts	Light	Ordinary	Light	Ordinary
Total weight	367,850 lb.	377,100 lb.	266,400 lb.	226,100 lb.
Weight on drivers	295,950 lb.	300,700 lb.	169,700 lb.	153,100 lb.
Size of cylinders (diameter and stroke)	30 in. by 32 in.	30 in. by 32 in.	27 in. by 28 in.	25 in. by 28 in.
Boiler pressure	175 lb.	175 lb.	180 lb.	165 lb.
Diameter of drivers	60 in.	60 in.	74 in.	69 in.
Tractive effort	71,500 lb.	71,500 lb.	42,200 lb.	35,600 lb.

The M-2-A locomotives have .40 per cent carbon steel (electric process) pistons and crossheads, (the crossheads being of the Laird type to reduce the weight), Nikrome steel piston, main and side rods, Nikrome steel main crank pin and nickel steel crosshead pins. The S-3 locomotives are similarly equipped with the exception of the crosshead pins which in this case are of Nikrome steel. The piston rods on both engines have a 2½-in. hole through the core and the maincrank pin a 4-in. hole. On the M-2-A locomotive the weight of the reciprocating parts is 379 lb., or 16 per cent lighter than the reciprocating parts on the M-2 locomotive. Similarly the weight of these parts is 73 lb. (5.33 per cent) lighter on the S-3 locomotives than on the S-2 locomotive. While the difference in this case appears small it must be noticed from the table below, that the S-3 locomotives are heavier and more powerful than the S-2 locomotives.

The M-2-A locomotives were built with these light reciprocating parts for the purpose of decreasing the effect on the track of the heavy counterweight required by the M-2 locomotives and to eliminate the use of the bob weights which were applied to the driving axles of the M-2 locomotives as a necessary addition to the counterweight in the wheels, the size of the wheels being such that the entire counterweight could not be contained therein. The S-3 locomotives were built with the light reciprocating parts for the purpose of obtaining heavier and more powerful engines than the S-2 locomotives without increasing the impact effect of the wheel load and counterweight on the track.

Test Methods

In order to determine the actual conditions existing for the locomotives under comparison, recording extensometers were used to measure the actual stresses in the girder flanges of the bridge, and the actual deflection of the girder was determined by means of a recording deflectometer. A comparison of the stresses and deflections caused by any two locomotives gives an idea of their relative impact effect. In order to secure data from which a comparison can be made as to the

relative impact effect of any two locomotives, it is necessary to realize certain conditions. The speed at which the two locomotives are run must be equal, and the counterweights on both locomotives must be in such a position that their maximum downward thrust due to centrifugal force is exerted at the same point on the bridge. The method followed for obtaining the data was to determine the points on the bridge at which the counterweight was in the down position and to determine the speed at which the locomotive was running. In making comparisons, records were selected from the test runs where the locomotives to be compared were running at

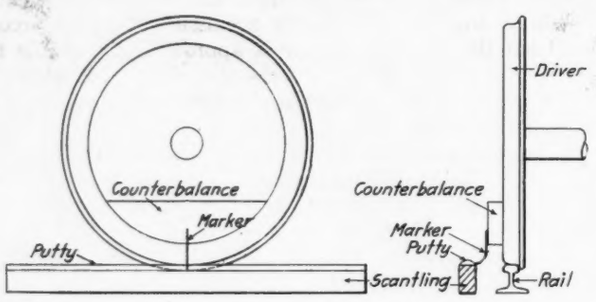


Fig. 1—Arrangement for Determining Location of Counterbalance Relative to the Center of the Bridge Span

the same speed, and where the counterweights came down at the same point on the structure.

The determination of the position of the counterweights was accomplished by placing a marker on the counterweight of the main driver. Alongside the rail was placed a scantling with a strip of putty on its upper edge. The scantling was so placed that the marker on the counterweight made a mark in the putty as the locomotive passed over the bridge. (See Fig. 1). The span center was used as a reference point, and the position of the counterweights is given in feet east or west of the span center. This information is given in the tables under the columns headed "C. B." Another column gives the speed in miles per hour at which each run was made. These speeds were determined by a stopwatch timing over a 1,000-ft. base line.

The detail results were worked up from the records of the recording extensometers and the deflectometer. By scaling the maximum ordinate from each record, the maximum flange stress or deflection caused by the locomotive is obtained for the test run in question. These are given under "M" in the tables. To obtain the impact effect the stress or deflection caused by the locomotive running at high speed is to be compared with values caused by the same locomotive running at low speed. These low speed records were taken for the locomotive crossing the bridge at a speed of about 5 m. p. h., for it has been found that at this speed the centrifugal force due to the counterweights is practically zero. In each series of test runs for a certain locomotive, the first and last runs were made at low speed, and are called "static" runs. The average values for these static runs are given in the columns of the tables headed "S." By subtracting these static values from the maximum values the excess due to the centrifugal force of the counterweights is obtained. In the tables these values are given in the columns headed "E." Finally, by dividing the excess by the static values, the "impact per cent" is obtained, the values of which are given in the columns headed "per cent E."

The instruments used in making the tests were two recording extensometers and one recording deflectometer. A complete description of these instruments is given in Bulletin No. 125 of the American Railway Engineering Association. The instruments were placed at the center of the top flange of the north girder supporting the center track. Extensometer No. 11 was placed on the north edge of the flange, and Extensometer No. 12 was placed on the south edge of the flange. The deflectometer was placed at the center point of the top flange of the girder.

Results of Tests

Locomotives M-2-A and M-2. Four test runs were obtained from each locomotive from which comparisons can be made. The data from these runs is given in Table 1. This table shows that the maximum stresses, deflection and impact are less for the M-2-A locomotive than for the M-2 locomotive notwithstanding the fact that the static values are equal. This, of course, is due to the light reciprocating parts of the M-2-A engine. The maximum impact obtained for the M-2-A engine during the tests was about 22 per cent and for the M-2 engine, 35 per cent. In both cases the speed was about 40 m. p. h.

Locomotives S-3 and S-2. Four test runs were obtained from each locomotive from which comparisons can be made. The data for these runs is shown in Table II. Engine S-3 has a greater static value than engine S-2, but notwithstanding this the maximum stresses and deflections shown are practically equal in all cases, indicating that, regardless of the difference in static value or the weight on drivers, the en-

Table I—Data for Comparisons Between Class M-2-A and M-2 Locomotives

				Extensometer No. 11				Extensometer No. 12				Deflectometer			
	Class	Speed, m. p. h.	C. B.	M	S	E	Per cent E	M	S	E	Per cent E	M	S	E	Per cent E
A	M-2-A	41.1	6.1 W	7,730	7,020	710	10.1	4,640	4,450	190	4.3	0.275	0.260	0.015	5.8
	M-2	41.1	5.8 W	8,800	7,020	1,780	25.3	4,840	4,520	320	7.1	0.305	0.258	0.047	18.2
B	M-2-A	44.9	7.0 W	8,100	7,020	1,080	15.4	4,720	4,450	270	6.1	0.275	0.260	0.015	5.8
	M-2	39.6	7.7 W	9,280	7,020	2,260	32.1	5,030	4,520	510	11.3	0.315	0.258	0.057	22.0
C	M-2-A	38.3	3.8 E	8,330	7,020	1,310	18.6	5,030	4,450	580	13.0	0.305	0.260	0.045	17.3
	M-2	39.6	2.8 E	9,350	7,020	2,330	33.1	5,550	4,520	1,030	22.8	0.315	0.258	0.057	22.0
D	M-2-A	42.1	2.3 E	8,270	7,020	1,250	17.8	5,420	4,450	970	21.8	0.300	0.260	0.040	15.4
	M-2	41.1	2.0 E	9,760	7,020	2,740	39.0	5,940	4,520	1,420	31.4	0.345	0.258	0.087	33.6

Values for extensometer given in lb. per sq. in. Values for deflectometer given in inches.

Table II—Data for Comparisons Between Class S-2 and S-3 Locomotives

				Extensometer No. 11				Extensometer No. 12				Deflectometer			
	Class	Speed, m. p. h.	C. B.	M	S	E	Per cent E	M	S	E	Per cent E	M	S	E	Per cent E
A	S-2	68.2	3.8 W	6,600	4,820	1,840	38.2	5,940	3,805	2,135	56.0	0.255	0.195	0.060	30.7
	S-3	68.2	3.7 W	6,300	5,120	1,180	23.0	5,030	4,260	770	18.1	0.260	0.205	0.055	26.8
B	S-2	66.9	1.5 W	6,600	4,820	1,840	38.2	5,160	3,805	1,355	35.5	0.245	0.195	0.050	25.6
	S-3	68.2	1.6 W	6,600	5,120	1,540	30.0	4,900	4,260	640	15.1	0.250	0.205	0.045	22.0
C	S-2	66.9	7.0 E	5,830	4,820	1,010	21.0	4,520	3,805	715	18.8	0.275	0.195	0.080	41.0
	S-3	66.9	6.7 E	5,950	5,120	830	16.2	4,900	4,260	640	15.1	0.260	0.205	0.055	26.8
D	S-2	66.9	9.2 W	6,600	4,820	1,840	38.2	5,290	3,805	1,485	39.0	0.260	0.195	0.065	33.3
	S-3	68.2	9.3 W	6,600	5,120	1,540	30.0	5,420	4,260	1,160	27.3	0.275	0.205	0.070	34.1

Values for extensometer given in lb. per sq. in. Values for deflectometer given in inches.

gines have the same effect on the track.* This is due to the lighter reciprocating parts on the S-3 engine. Test runs at speeds exceeding 75 m. p. h. were made with both locomotives, but as the counterweight positions were not similar no comparison can be made. It seems probable, however, that the conclusion reached from Table II still hold true for high speeds. At 65 m. p. h. the maximum observed impact for the S-2 locomotives was from 35 to 40 per cent and for the S-3 locomotives from 30 to 35 per cent. As stated above, in designing the S-3 engines, it was desired to produce an engine of greater tractive effort and greater weight on drivers than the S-2 engine, without producing greater stresses on track and bridges. These tests developed that the S-3 engines having 16,600 lb. greater weight on drivers and 6,600 lb. greater tractive effort, actually produce less stress on track and bridges than the lighter S-2 engines with which they were compared.

General Conclusions. Where the locomotives are of equal weight, the locomotive with heat treated steel moving parts is not as hard on bridges and track as a locomotive with ordinary steel moving parts. The use of heat treated steel moving parts allows the addition of considerable weight on the drivers over that used in a locomotive with ordinary steel moving parts without increasing the total effect of the locomotive on bridges and track.

Other Tests

In addition to the above report on impact tests, attention should be called to the very thorough investigation made of this subject by the American Railway Engineering Association which was published in its Bulletin No. 125 in 1911. This report includes an account of tests made with two Burlington Atlantic type locomotives one of which was a balanced compound having a weight of 51,000 lb. on the main driving axle. This engine was tested on a Pratt truss, pin connected single track bridge of 132 ft. span and a maximum percentage deflection of 15 per cent was obtained at a speed of 46 m. p. h. at the center of the span. At 58 m. p. h. the maximum speed at which this engine was run, the percentage deflection was 14 per cent. For comparison a test was run on a single expansion engine of the same type, having a weight of 46,500 lb. on the main driving axle, over the same bridge. This engine showed a maximum percentage deflection at the middle of the span of 26 per cent at a speed of 52 m. p. h., which was but 2 m. p. h. less than the maximum speed made by that engine during the tests. A legitimate comparison cannot be made between these tests and those of the Pacific type engine described above, due to the vast difference in the spans of the two bridges and to the difference in weight of the locomotives.

HOW RAILROADS COULD SAVE

The Chicago Daily News on May 3 published the following letter from Slason Thompson, director of the Bureau of Railway News and Statistics, Chicago:

"In a statement issued by the four railway brotherhoods from headquarters in Cleveland, printed in The Daily News recently, they suggest that their employers might find funds to meet the proposed $100,000,000 advance in wages by conserving their revenues in the matter of rebates and private cars.

"The Interstate Commerce Commission may be quoted to show that in 1915 fines imposed on the railways for rebating amounted to $264,000, and that during 1913 eighty-eight roads handled private cars free. From these the revenue at tariff rates would have been $644,250.79. If their revenues had been conserved by the amount of these two items it is obvious that the railways would be provided with $908,250.79 additional funds with which to meet the $100,000,000 eight-hour day demands of the brotherhoods.

"But it seems in their search for means to help the railways out of the $100,000,000 a year dilemma the four brotherhoods have overlooked one drain on railway revenues to which they might voluntarily apply a remedy. As a complement to the abolition of the private car practice let them forego the asking of free transportation for themselves and their families. In 1913 the four classes of trainmen numbered 336,444. With three to a family, a low estimate, they represented more than a million persons entitled to free transportation under the statutes. It is estimated that at least two trip passes annually are issued on such account and that the average journey is approximately double that of the average for all passengers, the majority of whom are short haul commuters—that is 66 miles and return, or 132 miles for each pass.

"Two trip passes for a million trainmen and their families amount to 264,000,000 passenger miles, which at two cents a mile. the present average in the United States, would add $5,280,000 to railway revenues.

"From the three sources suggested the following sums appear:

From fines for rebates	$264,000.00
From tariff on private cars	644,250.79
From free transportation renounced	5,280,000.00
Total	$6,188,250.79
Balance from public fares and rates	93,811,749.21
Total of 8 hour day demand	$100,000,000.00

"While the four brotherhoods might jump at the proposition to get $100,000,000 by renouncing $5,280,000 worth of transportation, where would the dear public get its rebate? Echo answers 'Where?'"

*The fact should not be overlooked, in this comparison, that the two locomotives have driving wheels of different diameter.—Editor.

SOME OF THE CAUSES OF RAIL FAILURES*

By W. C. Cushing

Chief Engineer Maintenance of Way, Pennsylvania Lines, Southwest System

From January 26, 1909, to December 16, 1912, there were 4,330 rail failures in 1,790 miles of single main track, being 60 failures for each 100 miles of track per annum. These were not all *broken* rails, but represent the sum total of all kinds of failures.

It is not practicable to make a complete survey of the chemical condition and physical properties of every rail which fails, when they are so numerous, and therefore it has been our custom to select at random rails which have failed in the different ways indicated by the "classification." For the purpose of this study, there has been surveyed the following number of each classification:

1—Broken	286
2—Flow of metal	15
3—Crushed head	19
4—Split head	153
5—Split web	18
6—Broken base	42
7—Damaged (without fracture)	2
Worn out in service	68
Total	603

Broken Rails

One is struck with the large number of breakages which occurred at a time when the roadbed was frozen, 203 out of 286, or 71 per cent. Furthermore, 96, or one-third of the fractures, occurred within the limits of the joint. If there was no fault to be found with the material, this would be a clear indication that the margin of safety of the rail under ordinary service conditions was quite small, because when the conditions became unusually severe, as in the case of a long-continued frozen roadbed, the rails immediately began

*Abstract from Bulletin No. 185, American Railway Engineering Association.

to break, and, to a considerable extent, at the weakest point, namely, the joint.

Examination in detail, however, discloses many defects in the chemical composition and the strength and ductility of the material, which must have had a detrimental influence and helped in a large measure to bring about failure, when the very small percentage of breakages to the total number of rails in service is borne in mind. There were but 31 cases of hardness not accompanied by brittleness, segregation or some other defect, such as rolling seam, slag or the presence of foreign metal due to the cutting of the ingot mould stool, or pieces of steel thrown on the stool to prevent cutting.

Some of these were probably helped along by rather inferior line and surface of track and poor condition of ties, but such conditions of track will always be met with, as perfection of roadbed and equipment cannot be continuously maintained, and consequently the rail material is expected to be strong enough to meet the conditions imposed.

STATEMENT OF RAIL FAILURES FROM JANUARY 26, 1909, TO DECEMBER 16, 1912, CLASSIFIED AS TO KIND OF FAILURE, SECTION, PROCESS AND WEIGHT.

Pennsylvania Lines West of Pittsburgh—South West System.

			Kind of failure						
Wt.	Section.	Process	Broken	Flow of metal	Crushed head	Split head	Broken web	Split base	Total failures
100	A. S. C. E.	Bessemer	100	4	59	156	13	3	335
100	P. S.	Bessemer	51	29	23	94	12	...	209
100	P. S.	O. H.-A.	3	...	1	...	1	...	5
100	P. S.	O. H.-B.	5	1	...	6	5	...	17
100	A. R. A.-A.	Bessemer	3	...	4	113	10	...	130
85	P. R. R.	Bessemer	43	6	35	315	17	7	423
85	A. S. C. E.	Bessemer	373	67	366	1279	129	87	2301
85	P. S.	Bessemer	202	12	211	326	73	35	859
85	P. S.	O. H.-A.	...	7	18	...	...	...	25
85	P. S.	O. H.-B.	2	2	5	10	1	1	21
85	P. S.	O. H. Mayari	5	...	...	...	...	...	5
	Total		787	128	722	2299	261	133	4330

In the case of 12 breakages in the joint only does one fail to account for the additional weakness at that point by defective material. In 21 of the rails, slag was present. As 19 of these were of the P.S. section, which was introduced with the year 1908, it would appear that the methods used by the mills for pouring ingots are not as good as those formerly used, or there is increased carelessness on the part of the workmen.

In the case of the A.S.C.E. and P.S. rails, it is noticeable in what a large percentage the carbon and phosphorus keep well up to the upper limit, and in many cases they are quite in excess. The manganese keeps more uniformly within the bounds assigned for it.

In the case of the P.R.R. *"broken"* and *"long service"* rails, the carbon keeps well below the upper limit, due largely to the fact that when they were rolled, the limits were five points less in each case, that is 0.40 and 0.50 per cent instead of 0.45 and 0.55 per cent. The long life of these rails, 13 to 17 years, indicates a less hard and brittle condition of the material, which is borne out by the tabulated statements. There are a few exceptions, which cause the observer to wonder whether the defects were kept dormant during all those years by the quantity of metal in the large heavy head.

Generally, the tensile strength of the *"broken"* and "good service" P.R.R. is less, and the ductility, measured by the elongation, higher than in the case of the other rails, due possibly to the lower carbon. There must also be other unknown conditions entering into the manufacture and service of these rails, and the mill practice with reference to mixing the ingredients, holding the molten metal for thorough chemical action, teeming it into the ingot moulds with care, soaking and then rolling, must play a very important part in the quality of the material and its endurance in service.

Additional experiments seem necessary, therefore, to settle the questions of percentage of carbon and size of rail head, as good results have also been obtained with much higher carbon and much thinner rail heads.

DEFECTIVE HEADS

The rails classified as "flow of metal," "crushed head," "split head" and "split web" are treated under the heading "Defective Heads," because what appears to be one defect is often another when cut open and examined. It is also rather difficult at times to distinguish between "flow of metal" and "crushed head."

It will be noticed from Table I that "defective heads" were very numerous during the period in question, 3,410, and that 2,299 of them were classified as "split heads." Of the total, 205 were examined, or surveyed, and the results tabulated. The first thing noticeable in examining the tabulations was that scarcely any of the failures have occurred in the joints, and the condition of the roadbed has no important bearing on the problem. Segregation, however, is an almost invariable companion of the defective head and web, and that is nearly always accompanied by one or both of the other defects, brittleness and hardness. Sometimes slag is present and sometimes foreign steel, due to the cutting or protection of the ingot mould stool, but an examination of a rail with a bad head will nearly always disclose segregation, brittleness and hardness. One or two of them is sometimes absent. A split head, however, very rarely occurs without the accompaniment of one or more of the defects, which is pretty positive proof that the metal will stand up under the load if it is homogeneous and free from defects. In the case of "flow of metal" and "crushed head" failures, the sulphur has often been found to be rather higher than normal.

It is the general custom now to have the rails stamped with letters to designate their location in the ingot, with the object of tracing defects back to the ingot in the study to bring about improved mill practice. The rails are stamped "A," "B," "C," etc., beginning with the top. The foreign steel is, therefore, usually found in the rails from the lower part of the ingot. Sometimes old scrap tie-plates were used for stool protection, and the shape of the plate was still discernible in the rail section. These discoveries brought about the discontinuance of the practice.

The results of the examination of so many "split head" rails seem to show that they are nearly always found in segregated rails having hard, unsound metal in the interior and softer metal at the surface. The flow of the softer metal develops a split in the harder unsound and less ductile metal in the interior of a badly segregated rail, resulting in a split head. The remedy seems to be to reduce segregation by making sounder and more homogeneous ingots, which can be done by the use of a sink head, as advocated by Sir Robert Hadfield.

BROKEN BASES

It may be said that rails made with initial drafts in blooming of 3 in. and 1.5 in. contained a larger number and deeper seams in the base than those made with 0.8 in. or less of initial draft. This resulted in poorer results in the drop tests and transverse tests of the base in the rails made with the heavier drafts. These results could be considered only as indicative and final conclusions should be withheld until sufficient work along this line has been done to warrant them.

H. B. MacFarland found that the base failures which precede the ultimate failure of about 90 per cent of the square and angular breaks are developed along the seams in the center of the base. He believes that these laminations in the base of the rails are due to the flowing of the metal when it is being reduced in passing through the rolls; the temperature being too low for the given pressure to form a solid molecular bond at the laminations. These conclusions seem to be confirmed by M. H. Wickhorst's investigations. Mr. MacFarland also found a reduction in the tensile strength of the material due to the cracks.

Long Freight Trains and Railway Accidents

A Study of the Relation Between Train Length and Accidents to Trains and Casualties to Persons

A BULLETIN just issued by the Bureau of Railway Economics presents the arguments for and against legislation limiting the length of freight trains. The following article is a summary of the contents of this bulletin.

Attempts to secure such legislation have been promoted by the railway labor brotherhoods in many states, and doubtless will be again as a substitute for the so-called "full crew" laws which in some states have been defeated and in others repealed. The grounds on which such proposals are urged are almost solely considerations of safety. It is claimed that the number of casualties on railways, especially to trainmen and passengers, is increasing, and that this increase is due to the increasing number of cars handled in a single train. During the winter and spring of 1914-15 bills to limit the length of trains were introduced in the legislatures of 20 states. All of them failed to pass. These states were: California, Colorado, Georgia, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Nevada, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, South Carolina, South Dakota, Utah, Wisconsin.

Arizona is now the only state in which legislation limiting the length of freight trains is in force. In that state trains are limited to 70 cars.

The bulletin furnished comprehensive material for a refutation of the claim that considerations of safety demand a limitation of the length of freight trains. On the contrary, though data are not available from which the fact is demonstrable by statistics, a careful study of such statistics as have been kept leads to the conclusion that so far from being an element of danger the operation of long trains is entitled to rank among the most effective safety measures. During the period in which the length of freight trains has steadily increased the number of railway accidents and casualties to trainmen, passengers and all other classes of persons, has shown a tendency to decrease. Further, this decrease is not only relative, when the increase in volume of traffic is taken into consideration, but in the case of fatalities an absolute decrease is shown.

In the attempts to secure legislation the limit has been variously set. In some cases trains a half mile long have been specified, in some cases 50 cars. When the matter was before the Illinois legislature in 1915 the railways successfully opposed the passage of a bill limiting trains to 50 cars. When this bill was subsequently amended, placing the limit at 75 cars instead of 50 cars it again failed of passage.

The bulletin first calls attention to the fact that the long train constitutes the cardinal feature of the increased efficiency of railway transportation in the United States. It is in line with various efforts to reduce the cost of units of product in every other industry. The use of long freight trains not only has reduced the necessity of raising freight rates in order to meet the marked increase in wages and prices generally, but it has also permitted reductions in rates. This has resulted in benefit to the entire population. An especial benefit has resulted to railway employees. Economies resulting from the operation of long trains have enabled carriers to meet successive demands for advances in wages. This has been possible even in the face of public restraint upon increases in rates. The pressure from the two directions could not have been sustained without economies in operation. A substantial part of these necessary economies has been due to the practice of handling freight in large units. Permanent improvements have been made in the railway property, benefiting not only the public but employees.

Statistics of the Interstate Commerce Commission show that the average number of cars per freight train on all the railways of the United States increased from 26.8 cars in 1904 to 34.3 cars in 1914, or 28 per cent. The larger railways show much greater averages. In some sections of the country the volume of single classes of freight warrants the handling of solid trains, which may be made up from 50 to 75 cars or more.

During the 10 years from 1904 to 1914 the average capacity of freight cars increased from 30 tons to 39 tons. The average load of each car increased from 17.7 tons to 21.1 tons. This average falls far short of indicating the capacity and loading of trains in sections in which freight density is greatest.

Train loading has increased nearly 50 per cent in ten years. In 1904 the average load per freight train was 307.8 tons. In 1914 it was 451.8 tons. On some lines the average load is over 1,000 tons, and in districts where mineral traffic is heavy trainloads from 3,500 to 5,000 tons are not uncommon.

Such increases have been made possible by a corresponding increase in the size and power of locomotives. The average weight of locomotives increased from 62 tons in 1904 to 83 tons in 1914, and average tractive power correspondingly.

To enable the railroads to haul these large capacity trains, corresponding changes have been necessary in every other part of the railway plant. The improvements have included the relaying of track with heavier rails, replacement of bridges, the reduction or elimination of curves, cutting down grades, rebuilding passing tracks and enlargement of terminal facilities of every kind.

Arguments for Limiting Train Length

The arguments presented by the labor brotherhoods may be classified under the following principal heads:

(1) It is difficult to transmit hand or lantern signals from the rear of a long train to the engine. Accidents may result from failure of the engineman to receive or understand such signals.

(2) There is more strain on the draft gear of cars near the locomotive in a long train; consequently, there is more risk of accident from the pulling out or breaking of drawbars. It is also claimed that the greater momentum of the long train puts a harder strain upon the brakes of forward cars.

(3) The liability of a train buckling is greater in a long train than in a short one; hence, there is greater liability of accident to trains upon an adjacent track. It is also said that because of the greater amount of slack in the draft gear of long trains more severe shocks result from a sudden stop. In addition to the risk of buckling it is claimed that the trainmen in the caboose are liable to be thrown down and injured.

(4) It is claimed that liability to accident from defective equipment is greater in long trains for two reasons: First, the strain upon draft gear is greater and the number of possible defects is increased in proportion to the increased number of connections; and, second, that there is greater likelihood that such defects will escape detection because of limited time for inspection.

(5) There is greater risk of accidents because of the

longer time required for stopping and starting long trains when it is necessary to do so to avoid accident.

Arguments Against Limiting of Train Length

All of the arguments advanced for train limit legislation are directed against the alleged greater hazard of the long train as a unit of operation. They take no account of the necessary increase in number of trains that would follow the limitation of train length. The arguments opposing such legislation are, therefore, divided into two groups: First, consideration of the alleged greater hazard to the long train as a unit of operation, and, second, the probable result of largely increasing the number of trains to handle a given volume of traffic.

It is contended that even as a unit of operation the claims made in regard to the greater hazard of the long train are not supported either by an analysis of the various elements involved, or by such statistical evidence as is available. The arguments for limiting train length, as previously stated, are answered in detail. The following is an abstract:

1. *Transmission of Hand Signals.*—The force of this argument is greatly impaired, if not destroyed, by changes in methods of operation and train control which have accompanied increases in the length of trains. Long trains ordinarily perform a different class of service from that in which short trains are used. The necessity of exchanging signals between the rear and the engine is much less frequent than in the shorter trains which do junction or local work. The long trains are ordinarily operated in through service. They move as a unit between division points with few stops. They ordinarily have the right of way over shorter trains doing local service. Frequently they have the right of way over the less important passenger trains. Except for taking on coal or water or for unforeseen contingencies, they make few stops between division points. The few occasions for stopping are ordinarily known to the engineman, hence there is little occasion for the transmission of signals by hand or lantern. Practically all cars are equipped with airbrake apparatus controlling the train from the engine. The engineman can be signaled from the caboose. He can call out the rear brakeman for flag duty by the locomotive whistle and recall him by the same means. In making up in terminal yards the length of the train as finally made up does not enter into the consideration. It then consists of several parts, each of which is ordinarily under the control of a member of the yard switching force not far distant from the engine. Whatever difficulties may be presented in the case of hand or lantern signaling on long trains are capable of being overcome by due care and attention. The remedy for any difficulty from this source would seem to be a recognition by employees of their own claim that operations with long trains are somewhat different from those with short trains.

2. *Failure of Draft Gear or Brake Rigging, Etc.*—The argument based upon failures of draft rigging fails to recognize that increase in the strength of the connections between cars and in the cars themselves has kept pace with increases in the capacity of cars and in the number that are operated as a single train. Probably no features of equipment have been given more study in recent years than draft gear and brake rigging. Both have been the subject of the combined study of manufacturers and railway officers and employees. The improvement in these features has been as marked as increase in the length of trains. It is common practice also, when it is necessary to use older and weaker cars in long trains, to locate them at points in the train where they will be subject to the least strain. Ordinarily they are employed in a class of service in which shorter trains fulfill the requirements of traffic.

3. *Buckling of Trains.*—If the operation of long trains were confined to the same kind of service for which shorter trains are ordinarily employed there would doubtless be a greater frequency of buckling. There is a greater amount of slack in the connections between cars and there will be a longer interval following the application of brakes on the forward cars before the action of the brake takes effect upon the rear cars. But long through trains are not subject to the necessity for making up in station order and empty cars may be distributed through the train. Stops are much less frequent in their regular service and emergency stops are reduced because of the rights allowed them on the road. Enginemen also understand that the manipulation of the brake apparatus will be governed by the weight of the train behind the tender. If the brake is properly manipulated there is no reason why in ordinary service a long train should not be brought to a stop with little or no shock and without undue strain upon cars or connections. From the nature of the service, therefore, and because the speed of the train is ordinarily lower than that usually attained by short trains between stops, the conditions which produce buckling are relatively few. The skill and carefulness of the engineman are the factors upon which safety depends.

So far as the brake apparatus is concerned, the argument is in favor of the long train. Short trains ordinarily move at higher speed between stops and in stopping the brake equipment is subjected to more severe strain.

4. *Detection of Broken Car Rigging En Route.*—Rigid terminal inspection of trains before departure leaves for consideration under this head only breakages that develop on the road. These ordinarily occur under the sudden strains of such operations as stopping, starting and backing. As previously pointed out, in the service in which long trains are used these operations are relatively infrequent.

5. *Possible Promptness of Control of Long Trains.*—It is true that brakes must be applied to long trains more gradually than is perhaps permissible with short ones. It is also true that a heavy train cannot be got under way so promptly as a light train, but this condition does not apply as between a train of nearly 50 cars and one of many more than 50 cars. There should ordinarily be no difference in the requirement of careful manipulation of brakes in the two cases.

It appears from the foregoing general analysis that the hazard in train operation lies mainly in maneuvering—stopping, starting, backing and switching—and in speed, but the service in which long trains are used is such that these operations are relatively infrequent. The trains run at a more uniform speed which is slower than that commonly attained by shorter trains doing local service. The maximum possible effect that the length of trains in through service can have on the large proportion of casualties which arise from train operation is small. This conclusion is supported by such statistics as are available.

Comparative Number of Accidents to Long and Short Trains

The statistics of the Interstate Commerce Commission are not kept in such form that it is possible to determine the relative numbers of accidents that have taken place with long and short trains. The advocates of train limit legislation have supported their principal claim by reference to the Commission's accident statistics. The extent to which they have been employed is limited usually to the general statement that casualties due to railway operations are increasing from year to year. When more specific comparisons have been made there has been a failure to distinguish accidents that might be considered as possibly related to long trains and accidents that cannot on any reasoning whatever be even remotely affected by the length of trains.

In the absence of complete data various railways have classified the casualties on their lines according as they occurred on long or short trains. At a hearing before a committee of the General Assembly of Virginia on a bill by which

it was proposed to limit all freight trains to 50 cars, N. D. Maher, vice-president of the Norfolk & Western, presented a statement for that road covering a period of two years. The statement showed the number of trains of over 50 cars and under 50 cars and the number of deaths and injuries resulting from their operation. A summary of this statement is shown in the following table:

TABLE I—PERCENTAGE DISTRIBUTION OF TRAINS AND CASUALTIES
(Norfolk & Western)

Class of trains	Number of trains	Per cent of total	Number killed	Per cent of total	Number injured	Per cent of total
Trains of more than 50 cars	16,712	35	9	8.6	195	21.5
Trains of 50 cars or less	31,112	65	96	91.4	714	78.5

It appears from this comparison that while there were more than one-half as many trains of over 50 cars as of trains of 50 cars or less, including passenger trains, the number of fatalities in connection with the long trains was less than one-tenth of the number in connection with the short trains. The number of injuries in connection with trains of over 50 cars was slightly more than one-fourth. For an equal number of long and short trains, the number of persons killed in connection with long trains was only about one-sixth of the number killed in connection with short trains. The number injured was only one-half as many.

The data in this case are complete enough to make a separation of the number of casualties to passengers and to employees and a distinction is possible as between passenger and freight service. Though the mileage of freight trains of more than 50 cars was 61 per cent of the entire mileage of freight trains, the number of fatalities to employees in connection with these trains was only 6.2 per cent of the total number. Fatalities to passengers were only 13.3 per cent of the total. In other words, for an equal number of miles run by long and short trains, the number of employees killed in connection with long freight trains was less than 5 per cent of the number killed in connection with short trains. The number injured was only 28 per cent. These facts are shown statistically in Table II.

TABLE II—PERCENTAGE DISTRIBUTION OF FREIGHT TRAINS AND CASUALTIES.
(Norfolk & Western.)

			Employees			
Class of trains.	Mileage.	Per cent of total.	Killed.	Per cent of total.	Injured.	Per cent of total.
Freight trains of more than 50 cars	4,173,027	61.3	1	6.2	179	30.5
Freight trains of 50 cars or less	2,633,000	38.7	15	93.8	407	69.5

	Passengers			
Class of trains.	Killed.	Per cent of total.	Injured.	Per cent of total.
Freight trains of more than 50 cars.	8	13.3	16	9.6
Freight trains of 50 cars or less	52	86.7	151	90.4

Statements leading to similar conclusions and statistics in support of them were presented by the Chesapeake & Ohio before the Virginia Assembly and by representatives of 23 railways operating in Illinois before the Illinois legislature when train limit bills were under consideration in those states.

CAUSES OF ACCIDENTS WITH RESPECT TO THE LENGTH OF TRAINS

An analysis of accidents to trainmen as assigned in the statistics of the Interstate Commerce Commission indicates that long trains do not tend to increase the risk of accidents in any material degree, if at all. In the bulletin is given a statement of all the casualties to trainmen occurring in the year ended June 30, 1915. In this are specially indicated those classes of accidents in which the length of train may be considered to have had some possible influence. A summary of this table indicates that 15 per cent of the number of accidents might conceivably have been due in some cases to the length of trains. The actual number of these accidents due to that cause can only be a fraction of this percentage. Not all of the accidents happened to long trains, nor even a large proportion of them. Long trains are only a small portion of the total number. In 1914 the average number of cars per freight train was only 34.3. This shows that a large majority of trains must have had less than 50 cars. It is further highly improbable that more than a small part of such long trains as suffered collisions or derailments did so by reason of any cause due to their length. This consideration reduces the percentage of all accidents that probably was due to long trains to a point that is practically negligible.

Casualties to trainmen from causes other than collisions and derailments are shown to have been a fraction over 15 per cent in case of killed and injured in accidents which could on any hypothesis have been affected by the length of trains. The same causes, however, operate independently of the length of trains and have more occasions to operate in connection with short trains because of the greater number of short trains. A summary of the table from which the foregoing conclusions are derived is presented as Table III.

TABLE III—SUMMARY OF CAUSES OF CASUALTIES

Causes	Number of accidents	Number of casualties to trainmen: Killed	Injured
Total casualties from causes other than collisions and derailments	.....	710	31,928
Total casualties from accidents, other than collisions and derailments, of which *some* might have been due to length of trains	.....	109	5,070
Per cent such casualties were of all casualties from causes other than collisions and derailments	.....	15.4	15.9
Total collisions and derailments	10,387	...	...
Total from causes, of which *some* might have been due to length of trains	1,545	...	...
Per cent such accidents were of all collisions and derailments	14.9	...	...
Total casualties from collisions and derailments	.....	174	2,373

THE HUMAN FACTOR IN ACCIDENTS

There is abundant evidence that a large percentage of accidents to trains as well as to employees themselves is due to error or failure on the part of employees. It is argued from this that an increase in the number of trains which would be a necessary result of limiting the length of trains would be attended by an increase of accidents. In a summary of the results of investigation through its own agents of accidents which have occurred between 1902 and 1915 the Commission found that of 1,635 accidents so investigated, 1,150 were due to negligence, mistakes or other failures of employees; 240 to mechanical defects of track equipment, signal system or brake apparatus, and the remainder to weather conditions, outside interference, parting of trains, miscellaneous and unknown causes. Of the whole number 70 per cent were due to error or failure on the part of the personal element directly concerned in train operation. Less than 10 per cent could reasonably be connected with the length of trains. Of this 10 per cent a very large proportion was due to causes which might as well have operated in connection with short trains.

From the foregoing consideration, which is confined exclusively to trains as units of operation, it may be concluded that the proposition that long trains are more hazardous units of operation than short trains is unsupported by the general considerations, and that such specific data as are available tend toward the opposite conclusion.

EFFECT OF INCREASED TRAIN DENSITY ON ACCIDENTS

Even if it were shown that the long train as a unit of operation is more hazardous than the short train it would fail to be conclusive upon the main point. The argument fails to take account of the more inclusive transportation problem involved. In other words, if it could be shown that there is less danger of accident in connection with the operation of one train of 50 cars than in connection with the operation of one train of 75 cars this would not prove that it would

be safer to move 150 cars in three trains of 50 cars than in two trains of 75 cars each.

It is obvious that if the length of trains is reduced freight that is now carried in that portion of trains in excess of the limit will have to be handled in other trains. It could not to any appreciable extent be handled in trains that are now shorter than the proposed maximum. Many of the shorter trains move in a direction that is opposite to the principal flow of traffic. Many others are operated in a service in which the higher rate of speed is an element of efficiency. Ordinarily no part of a possible long train can be left for attachment to a shorter train whose assigned service is of a different character. Classification is essential to the expedited movement of high class merchandise, live stock and perishable commodities. It enables the despatcher to give certain trains the individual movement required by the nature of their service. Otherwise the movement of certain commodities would be dangerously delayed and the movement of others unnecessarily accelerated. Any limitation of train length would result in an increase in the number of trains beyond what would otherwise be necessary.

Suppose 150 cars are to be moved in each direction. The question then is the relative safety of operating two trains of 75 cars in each direction, or three trains of 50 cars in each direction. Theoretically, in the first case there will be four meeting points, in the second nine; or, in the first case four chances of butting collisions in handling a given number of cars, and in the latter case nine chances. As a practical matter, each train does not meet all the others, but it is obvious that the chances of collision, even though they do not actually increase as the square of the number of trains, do increase much more rapidly than the number of trains.

The bulletin of the Bureau of Railway Economics quotes an illustration offered by M. W. Potter, president of the Carolina, Clinchfield & Ohio, before a committee of the Virginia Assembly. The basis of his illustration was the movement of 48,000 tons over one section in one day, effected with sixteen 3,000-ton trains or eight 6,000-ton trains. With eight trains each way there would be 64 meeting points; with four trains, only 16 meeting points. In other words, four times the danger in transmitting orders and giving signals, four times the danger of derailments in going into and out of sidings, four times the stops, four times the application of brakes, four times the sudden strain, wear and tear, four times the danger of congestion and liability of collision. Though this result would not happen in actual practice, it is clear that all the risks enumerated would be increased much more than in proportion to the increase in the number of trains.

Accidents at grade crossings obviously bear a close relation to the number of trains as well as to the number of persons using the crossings. During the 12 months ended June 30, 1915, 1,086 per sons were killed and 2,981 persons injured at grade crossings. The great majority of these persons, or 997 of those killed and 2,898 of those injured, were neither railway employees nor trespassers. They were, presumably, persons who were utilizing the crossings in the course of their usual activities. The more trains that are run the more chances there will be of injury to persons at highway crossings.

The influence of the long train in restricting the increase in number of trains may be strikingly shown by the statistics of the Interstate Commerce Commission. The number of tons of freight carried one mile in the United States in 1914 was nearly four times as great as in 1894. From 1904 to 1914 the increase was 65 per cent. Density of freight business, or ton miles per mile of line, increased 36 per cent during this 10-year period. On the other hand, freight train density—which is the average number of freight trains run over each mile of line per year—decreased 3.8 per cent. Had not trainloads been increased, this growth of traffic would have caused a corresponding increase in train density, or, in ordinary language, in number of trains. If the length of trains be now limited a considerable increase in number of trains would be required to handle the present volume of business, and increase in all the hazards of operation would follow such an increase.

Statistical Evidence of the Relation of Accidents and Casualties to Train Density

The increase in the number of trains operated per mile of line has been shown to have been very small in relation to the increase of the amount of freight handled, but there have been years when there were sharp increases or decreases in the total number of freight trains run due to fluctuations in the total amount of freight to be handled. These changes have caused as between consecutive years increases and decreases in freight train density. The effect that has been produced on the number of railway accidents by reason of these increases in the number of trains is doubtless similar to what would be produced by an increase in the number of trains necessitated by legislation reducing their length. It is claimed by the opponents of train limit legislation that limitation of train length will cause a greater number of accidents and casualties to employees and passengers than would occur otherwise. This position is fully supported by the statistics.

In the accompanying tables are shown in parallel columns year by year from 1903 or 1904, according as the statistics are available, to 1914 the total train mileage, density of all trains, and numbers of accidents to trains or casualties to persons. In the case of each column, increases from one year to another are indicated by "I" and decreases by "D." The tables thus present in somewhat graphic form a view of the close relation which exists not only between increases in train density and increases in numbers of collisions and derailments, but also of the relation between increases in train density and casualties to trainmen and passengers.

Table IV—Relation of Collisions and Derailments to Train Density*

Year	Total train mileage	Train density	Collisions	Derailments
1903	982,946,284	4,848	6,167	4,476
1904	1,007,529,452 I	4,826 D	6,436 I	4,855 I
1905	1,038,441,430 I	4,839 I	6,224 D	5,371 I
1906	1,105,877,091 I	5,035 I	7,194 I	6,261 I
1907	1,171,922,997 I	5,211 I	8,026 I	7,432 I
1908	1,129,149,453 D	4,931 D	6,363 D	6,671 D
1909	1,112,452,351 D	4,776 D	4,411 D	5,259 D
1910	1,221,852,647 I	5,131 I	5,861 I	5,918 I
1911	1,237,500,138 I	5,081 D	5,605 D	6,260 I
1912	1,236,758,715 D	4,986 D	5,483 D	8,215 I
1913	1,280,931,735 I	5,090 I	6,477 I	9,049 I
1914	1,251,791,798 D	4,909 D	5,241 D	8,565 D

Table V—Relation of Casualties to Trainmen on the Road, Occurring in Collisions, to Train Density*

Year	Total train mileage	Train density	Casualties to trainmen: Killed	Injured	Total casualties
1904	1,007,529,452	4,826	267	2,077	2,344
1905	1,038,441,430 I	4,839 I	259 D	1,922 D	2,181 D
1906	1,105,877,091 I	5,035 I	331 I	2,348 I	2,679 I
1907	1,171,922,997 I	5,211 I	364 I	2,702 I	3,066 I
1908	1,129,149,453 D	4,931 D	191 D	1,832 D	2,023 D
1909	1,112,452,351 D	4,776 D	145 D	1,266 D	1,411 D
1910	1,221,852,647 I	5,131 I	216 I	1,765 I	1,981 I
1911	1,237,500,138 I	5,081 D	184 D	1,634 D	1,818 D
1912	1,236,758,715 D	4,986 D	186 I	1,740 I	1,926 I
1913	1,280,931,735 I	5,090 I	162 D	1,824 I	1,986 I
1914	1,251,791,798 D	4,909 D	128 D	1,031 D	1,159 D

Table VI—Relation of Casualties to Trainmen on the Road, Occurring in Derailments, to Train Density*

Year	Total train mileage	Train density	Casualties to trainmen: Killed	Injured	Total casualties
1904	1,007,529,452	4,826	229	1,078	1,307
1905	1,038,441,430 I	4,839 I	223 D	1,316 I	1,539 I
1906	1,105,877,091 I	5,035 I	220 D	1,385 I	1,605 I
1907	1,171,922,997 I	5,211 I	259 I	1,786 I	2,047 I
1908	1,129,149,453 D	4,931 D	203 D	1,412 D	1,615 D
1909	1,112,452,351 D	4,776 D	171 D	996 D	1,167 D
1910	1,221,852,647 I	5,131 I	188 I	1,272 I	1,460 I
1911	1,237,500,138 I	5,081 D	184 D	1,211 D	1,395 D
1912	1,236,758,715 D	4,986 D	191 I	1,610 I	1,801 I
1913	1,280,931,735 I	5,090 I	169 D	1,418 D	1,587 D
1914	1,251,791,798 D	4,909 D	159 D	1,221 D	1,380 D

TABLE VII—RELATION OF CASUALTIES TO TRAINMEN ON THE ROAD, ALL TRAIN ACCIDENTS, TO TRAIN DENSITY*

Year	Total train mileage	Train density	Casualties to trainmen: Killed	Injured	Total casualties
1904.....	1,007,529,452	4,826	558	4,135	4,693
1905.....	1,038,441,430 I	4,839 I	533 D	4,210 I	4,743 I
1906.....	1,105,877,091 I	5,035 I	612 I	4,769 I	5,381 I
1907.....	1,171,922,997 I	5,211 I	707 I	5,540 I	6,247 I
1908.....	1.129,149,453 D	4,931 D	453 D	4,138 D	4,591 D
1909.....	1,112,452,351 D	4,776 D	352 D	2,989 D	3,341 D
1910.....	1,221,852,647 I	5,131 I	479 I	4,123 I	4,602 I
1911.....	1,237,500,138 I	5,081 D	428 D	4,048 D	4,476 D
1912.....	1,236,758,715 D	4,986 D	407 D	4,367 I	4,774 I
1913.....	1,280,931,735 I	5,090 I	369 D	4,072 D	4,441 D
1914.....	1,251,791,798 D	4,909 D	296 D	2,721 D	3,017 D

TABLE IX—RELATION OF CASUALTIES TO PASSENGERS, ALL TRAIN ACCIDENTS, TO TRAIN DENSITY*

Year	Total train density	Train density	Casualties to passengers: Killed	Injured	Total casualties
1903.....	982.946,284	4,848	215	4,931	5,146
1904.....	1,007,529,452 I	4,826 D	270 I	4,945 I	5,215 I
1905.....	1,038,441,430 I	4,839 I	350 I	6,498 I	6,848 I
1906.....	1,105,877,091 I	5,035 I	182 D	6,778 I	6,960 I
1907.....	1,171,922,997 I	5,211 I	410 I	9,070 I	9,480 I
1908.....	1,129,149,453 D	4,931 D	165 D	7,430 D	7,595 D
1909.....	1,112,452,351 D	4,776 D	131 D	5,865 D	5,996 D
1910.....	1,221,852,647 I	5,131 I	217 I	7,516 I	7,733 I
1911.....	1,237,500,138 I	5,081 D	142 D	6,722 D	6,864 D
1912.....	1,236,758,715 D	4,986 D	139 D	9,391 I	9,530 I
1913.....	1,280,931,735 I	5,090 I	181 I	8,662 D	8,843 D
1914.....	1,251,791,798 D	4,909 D	85 D	7,001 D	7,086 D

*Accident statistics are from Interstate Commerce Commission Accident Bulletins. Train-mile statistics are from the annual report of the Interstate Commerce Commission.

It is apparent from the foregoing tables that the relation existing between increases and decreases in train density and in casualties to passengers and trainmen is sufficiently close to warrant the conclusion that it is one of cause and effect.

An increase of train density would in all probability tend to increase other classes of casualties than those which have been considered. Additional trains upon the road would augment the business in terminal yards and thus effect an increase in casualties to other employees than trainmen on the road. The effect of an increase would probably be especially noticeable in connection with casualties at highway crossings. Occasions or opportunities for accidents and casualties would increase more than in proportion to the increase in number of trains. Train limit legislation, therefore, by making train density higher than it would otherwise be, would not only result in accidents to more trains and casualties to more persons than otherwise, but would increase the chances of each train and of each trainman and passenger meeting with disaster.

It is, of course, admitted by railway officers that other influences have been exerted in the direction of securing a greater degree of safety in railway operation, but since fluctuations in train density in either direction are ordinarily accompanied by changes in the same direction in number of casualties, the influence of train density appears to predominate.

DECREASE IN CASUALTIES IN RELATION TO SERVICE PERFORMED

It is recognized that in railway operation loss of life and personal injury are unavoidable. The problem is to reduce their numbers in proportion to the volume of service performed. That this is exactly what the railways have been doing may be shown statistically. The accompanying Table XI presents a comparison of the average increases in railway traffic with the numbers of casualties to employees and passengers in the periods 1905 to 1909 and 1910 to 1914. Comparisons between individual years may be objectionable on the ground of the unrepresentative character of one or both of the years selected. For that reason the accompanying table presents annual averages for two periods of five years each. The entire 10-year period has been especially characterized by the increase in the length and capacity of freight trains.

TABLE XI—SUMMARY OF INCREASES IN RAILWAY TRAFFIC IN RELATION TO NUMBER OF CASUALTIES

*Comparison of Averages for Five-year Period 1905 to 1909 with Averages for Period 1910 to 1914, Inclusive**

	Average per year, 1905-1909	Average per year, 1910-1914	Increase per cent 1905-1909 to 1910-1914
Freight ton miles.....	215,225,000,000	272,519,000,000	26.6
Freight train miles.....	585,300,000	625,616,000	6.9
Passengers one mile	26,976.000,000	33,739,000,000	25.1
Passenger train miles.....	492,030,000	581,890,000	18.3
Total freight and passenger train miles	1,077,000,000	1,208,000,000	12.2
Number of employees.....	1,502,945	1,725,842	14.8
Mileage of roads	226,532	229,388	10.1
Number of employees per 100 miles of line.....	663	692	4.4
Number of employees—			
Killed	3,447	3,186	7.6 Dec.
Injured	54,357	55,047	1.3
Number of passengers—			
Killed	469	353	24.7 Dec.
Injured	11,917	15,047	26.3

*Computed from "Statistics of Railways in the United States," Interstate Commerce Commission, and from Accident Bulletins for the years included. "Industrial Accidents" are excluded.

These comparisons show that the increases in casualties have been much smaller in proportion than the increases in the volume of railway service rendered, except in the one item of percentage of passengers injured. In fact, in the last five-year period there were absolute decreases in fatalities to both passengers and employees, notwithstanding an increase of about 25 per cent in the average amount of passenger and freight traffic handled and of over 14 per cent in the average number of employees. As to the increase in number of passengers injured, the fact that the number of passengers killed in proportion to the amount of passenger business decreased about 40 per cent indicates a marked reduction in serious accidents to passengers. It indicates also a probable reduction in the severity of casualties to passengers.

CONCLUSIONS AS TO THE SAFETY OF LONG TRAINS

Though not specifically stated, the following conclusions can fairly be drawn from the material contained in this bulletin:

1. There is no evidence in support of the conclusion that long trains as units of operation are more dangerous to operate than short trains.

2. A consideration of the character of the service ordinarily performed by long trains indicates that their operation is accompanied by less risk to employees, passengers and others than the operation of short trains. Such statistical evidence as is available tends to support the same conclusion.

3. While in recent years the density of freight traffic has greatly increased, train density has decreased. The number of accidents to trains and casualties to employees and passengers has decreased not only in relation to the volume of traffic handled, but absolutely. The relation between train density and casualties is one of cause and effect. The decrease in train density has been largely due to the operation of long trains.

4. Limiting the length of freight trains would increase train density by making it necessary to operate more trains to handle a given amount of traffic.

5. An increase in train density would be followed by an increase in all the hazards of railway operation.

ECONOMIC CONSIDERATIONS

If it could be shown that the operation of long trains entailed increases in casualties purely economic considerations would be forced to give way to the more important consideration of safety. It appears from the foregoing that the effect of an increase in the length of freight trains is not to increase the hazard of operation, but, so far as is determinable, has the opposite tendency. It is pertinent, therefore, to mention

some of the economic considerations that would be involved as a result of train limit legislation.

Much of recent railway investment has had as its principal purpose to enable the operation of long trains. Railway companies have made large investments for the reduction of grades and the elimination of curvature and in the construction of long passing and yard tracks. Equipment has been built of increased strength, steel has been substituted for wood in the construction of cars and improvements in brake systems, connections between cars, etc., have been made with the purpose and effect of making the train more nearly a unit than formerly. The tractive power of locomotives has been greatly increased at a considerably increased cost per locomotive. Engine terminals and all other facilities have been adapted for the accommodation of large equipment. A large proportion of this investment would be rendered valueless by legislation limiting the length of trains.

Many economies in operating expenses would be lost. The increase in the average number of tons hauled per train has been accompanied by decreases in the cost per ton of hauling freight. Except for the economies effected by this increase in the length and capacity of trains either rates could not have been reduced or the wages of employees could not have been increased.

Legislation limiting the length of freight trains would also require additional investment. It would necessitate an increase in the number of locomotives, the remodeling of locomotive terminal facilities, the construction of additional tracks, sidings, switches and signal apparatus, in a ratio indicated approximately by the increase in the number of trains that would result from the limitation of train length. When a bill to limit the length of freight trains to 50 cars was pending in the legislature of Illinois data were compiled by 23 roads, operating 8,781 miles of railway in that state, in which the amount of investment rendered valueless was estimated at $5,198 per mile; increase in operating expenses per year, $488 per mile; immediate investment of new capital, $1,384 per mile; amount of new capital the investment of which would be made necessary in 10 years, $4,976 per mile. Of course, it can only be conjectured whether similar legislation would produce proportionate effects on the entire mileage of railway in the United States.

Since legislation limiting the length of trains would increase both fixed charges and operating expenses, it is clear that the result would be an increase in the passenger and freight rates which railways would have to charge the public.

CHANGE-MAKING MACHINE FOR TICKET WINDOWS

The Chicago & North Western has recently installed in the ticket windows at its passenger terminal in Chicago a change-making machine for the purpose of saving the time of its ticket sellers and of passengers and of avoiding congestion during the rush periods just before train time, when it is necessary for the ticket sellers to handle a great deal of small change in a hurry.

The machine which has been tested is called the Lightning Change Maker, and is manufactured by the Barrett Changer Company, Chicago. The type of this machine which is suitable for railroad ticket office use is shown in the accompanying illustration and has 26 numbers and keys arranged like those of a typewriter, which are used to operate the machine to make change from $1. In operating it the key corresponding to the amount of the purchase is pressed, and the machine delivers the proper amount of change into a saucer-shaped receptacle from which the patron removes it. In another type of the machine, which is also shown in the illustration, the change falls into a money pocket from which it is taken by the operator. The apparatus is smaller than the usual type of adding machine, and is housed in a deep metal case. On top is a coin tray with compartments for the different denominations of coins.

Nineteen of the keys represent amounts from 5 to 95 cents in multiples of 5. If $1 is handed to the ticket seller in payment for a 10-cent ticket the 10 key is pressed and 90 cents is delivered into the receptacle directly in front of the

Direct-Paying Change Maker as Installed in Ticket Window

passenger on the ticket counter. By pressing certain readjusting keys, however, the machine will make change from smaller denominations than $1, such as 75, 50 or 25 cents. For instance, if 50 cents were given instead of $1, the operator would press a red key marked "50" adjusting the machine to make change from a half dollar and would then

Change Making Machine Showing Keyboard

press the 10 key, causing the delivery of 40 cents. In the middle of the keyboard there is a series of white keys which control the penny stacks in the coin tray. Pressing these keys causes the machine to pay out from 1 to 4 cents, and they are used when the amount of the purchase ends in a sum not a multiple of 5.

Convention of the Air Brake Association

Reports on Slack Action in Passenger Trains, Apprentices, and Elimination of Moisture from Train Lines

A Group of Convention Attendants in Front of the Ansley Hotel, Atlanta, Ga.

THE twenty-third annual convention of the Air Brake Association was held in Atlanta, Ga., May 2 to 5, J. T. Slattery, superintendent of the Denver & Rio Grande, presiding, as noted in the last week's issue, page 1007.

President's Address

The president called particular attention to the need of better air brake maintenance. He believed that railway officers were taking more interest in air brake questions but it seems that the money to be spent for maintenance of air brakes is still grudgingly given. The importance of the air brake in safely conducting the transportation business would seem to warrant a more liberal expenditure of money for its maintenance.

SLACK ACTION IN LONG PASSENGER TRAINS

Slack action in any train is produced only by a change in speed between the various cars comprising such trains. The degree or severity of such slack action depends on the rate at which the change in speed takes place, and the weight and number of cars involved. The condition having the greatest effect in producing slack action, ordinarily, is that of producing brake cylinder pressure sufficient to set up retardation on cars in the forward end of the train sufficiently in advance and to a degree that will cause the train to bunch when an ordinary brake application is started. Loaded baggage, mail, express and other load carrying cars that do not maintain the same percentage of braking power on account of their load as the other cars on the rear of the train, cause the slack to be pulled out of the train as the brake cylinder pressure is accumulated on the rear cars. This is brought about by small cylinder volumes in proportion to auxiliary reservoir volumes, which in many cases is caused by the action of foundation brake gear in connection with automatic slack adjusters.

It is therefore evident that brake cylinder pressure must rise gradually in order that the slack movement in the train will be taken care of gradually, unless the speed be very high. Under the present order of general passenger brake conditions this must be brought about by the brake pipe reduction being made in light steps and an increase in the time of making stops. The amount of the initial and succeeding brake pipe reductions, producing brake applications, must therefore be made in proportion to the speed of the train and the number of cars involved. It is necessary to maintain a brake cylinder volume equal to 8 in. piston travel on cars, if it is desired to obtain proper brake cylinder pressure, and at the proper rate that the operating mechanism was designed for. Some means will have to be provided to offset the bad effects of heavy cars and single shoe type of foundation brake gear. The automatic slack adjuster cannot be eliminated, since it is impractical to attempt manual adjustment of piston travel on passenger cars generally.

Therefore it can be seen that although a train may be equipped throughout with PM or LN equipment, many faults exist in which the type of triple valve has no bearing. The manner in which experience has demonstrated the responsibility of the triple valve in relation to slack action in passenger trains, is that in connection with mixed PM and LN equipments, where the graduated release of the L triple valves are being used in connection with cars in the same train equipped with P triple valves. The L triple valve, if a reduction of brake pipe pressure is made after a partial release, develops a higher brake cylinder pressure in proportion to the brake pipe reduction than is the case with the P triple valves. This feature of the L valve produces a high rate of brake cylinder pressure increase which may produce slack action in trains.

There are four causes contributing to poor train handling but no attempt will be made to cover them more than fully enough for those broadly informed on the subject to follow cause and effect.

Weight of Vehicle.—This necessarily involves magnitude of braking forces which in turn means large brake cylinders, which require: Large air volumes; large air valves, and heavy foundation brake gear.

Length of Trains.—This introduces a serious element into brake operation and performance, namely, that of time, particularly that of difference in time between brake application on the vehicles at the front of the train and those at the rear, permitting retardation to commence at the front of the train long before it commences at the rear, thus bunching the train and producing a reaction when an equivalent retardation from brake action ultimately takes place at the rear. Troubles arising from the time factor must exist as long as present conditions of brake apparatus exist.

Foundation Brake Gear.—The faults in the present foundation brake gear are principally in the spring sus-

pension of hangers, the shoes being hung very low on the wheel, and the use of the "single shoe" type of gear. This design and type of foundation brake gear necessarily involves the condition of very short piston travel, which even with very light reductions results in a complete annulment of the proportions of the air brake proper, which results in very heavy braking forces, even when the lightest is necessary to avoid shock. In the endeavor to avoid this shock on the part of the engineer by making very light reductions, so little differential in pressure is produced between brake pipe and auxiliary reservoir that some of the brakes will fail to release.

Air Brake Valve Mechanism Itself.—When length and weight of trains was much less than at present (remember that many cars in trains of today now require two complete brakes per car) the attainment of a comparatively great and rapid differential or change of pressure was easily secured, but under present conditions this necessary condition is not possible with the equipment now used.

This report has dealt only with the fundamental causes of the bad effects, and the remedies suggested strike at the root of the evil. The report is signed by J. A. Burke, chairman, and W. Hotzfield.

Discussion

With the single shoe type of gear the shoes are hung below the horizontal center line of the wheels and as they are pulled down by the friction of the wheel, in heavy brake applications, the automatic slack adjusters compensates for this additional horizontal movement of the shoes and thereby shortens the piston travel which gives unequal braking. For this reason the clasp type of brake was strongly recommended. With this type the shoes are hung on the horizontal center line of the wheels and the pressure of each individual shoe on the wheel may be reduced. The forces acting on the truck are also such as to tend to keep the shoes in their proper position relative to the wheel and thereby calls upon the automatic slack adjuster to adjust for shoe wear only, thus keeping the brake piston cylinder travel constant. It was also stated that an 11-ft. truck wheel base was about the minimum length to which a clasp brake could be applied. With conditions such as they are at the present time it is believed necessary to take longer time in stopping the long passenger trains, than is necessary in stopping the short trains, by a more gradual application of the brakes. This will tend to reduce to some extent the disagreeable and sometimes disastrous shocks to the trains. The subject was continued for the purpose of investigating means for overcoming the difficulties now met in train operation with the present air brake systems.

AIR BRAKE APPRENTICES

Few, if any, railroads have made any effort, until recently, to produce specially trained men to take care of the air brakes. The air brake, seemingly, is supposed to be an automatic device, not only in its operation but also in its inspection and maintenance. Air brake mechanics are generally selected in locomotive service from machinists or in car service from car repairers or helpers. According to the schedules of most railways, machinist apprentices are given their choice of two or three months in either "the tool room, air room, or brass corner." This is usually the experience that a greater part of the air brake mechanics have during their apprenticeship. They are, therefore, not equipped to take the responsibility of air brake work in the roundhouse or shop but must get their training by experience after becoming machinists.

One railroad is training machinist apprentices for air brake work by giving them their last six months on air brake work with the two or three months they had in the air brake repair room. This will give them eight or nine months of practical experience. This road gives all machinist apprentices air brake class room instruction once a week for four to six months of the year. Another railroad gives six months in the air brake repair room, six months in roundhouse air brake running repairs and turns the technical training over to the International Correspondence School. Many roads operate air brake instruction cars but the apprentice has little chance of obtaining from these cars the knowledge he requires to make an air brake mechanic of himself.

Following are the proposed schedules for specializing apprentices on air brake work. They will have served two and a half years as machinist apprentices, and when they get in the air brake work, if they show themselves especially adapted for this work, they may be made air brake apprentices and given the following schedule to finish their time as such:

	Months.
Air brake repair room in general shops	8
Lubricators, injectors, and headlights	3
Air brake pipe work	1
Roundhouse air brake repairs, inspecting, etc.	5
With road foreman of engines, air brake instruction car, or firing	1
Total	18

The lubricator, injector, and headlight work is added to aid the air brake repair man in a small roundhouse who has all these things to look after. At the same time it gives the air brake mechanic a little greater variety of jobs.

The schedule following will give an air brake apprenticeship from the start. Boys should be given six months as others are, and if not fitted for the work could be transferred or dismissed:

	Months.
Repairing hose, angle and cutout cocks, retainers, etc.	3
Cleaning and repairing triple valves	6
Drill press and lathe work	3
Repairing pumps	3
Repairing brake valves and engine equipment	4
Lubricators, injectors, headlights	3
Air brake pipe work	2
Rip-track air brake work	1
Inspecting trains (helper)	1
Roundhouse air brake work	9
With road foreman of engines, air brake instruction car and firing	1
Total	36

It may be said that there is not enough demand for air brake mechanics to afford a place for such an apprenticeship. Yet, if the number of men who are employed on railroads in the service of tinner, blacksmith, painter, upholsterer, patternmaker, molder, etc., for all of which an apprenticeship course is furnished, is compared with the number of men working on air brakes, lubricators, and injectors, it will be found that the latter will exceed any one and most any two of the former classes. A schedule for air brake apprentices for car work is given below:

	Months.
Dismantling air brake equipment	1
Repairing hose, angle cocks, etc.	2
General rip-track and air brake repair work	10
Cleaning and repairing triple valves	4
On brake cylinders	2
Leverage work	1
Testing	1
Inspecting trains	8
Braking on road	1
Total	30

This would make a trade out of air brake repairing and inspecting and would secure better men in the service; it would produce men that would be valuable assets to the car department. The efficient air brake mechanic will keep down failures, keep engines and cars moving, and add much to the life of air brake equipment. The value cannot be estimated, nor can the railroad determine the exact results from such an expenditure, but it will be repaid many times for the efficiency added to these departments.

The paper was signed by C. M. Drennan.

Discussion

It was quite forcefully pointed out that a good systematic apprentice system for training air brake mechanics is a most important matter for the roads to consider. There is no question that a lot of work is done inefficiently and that delays occur because men handling air brake repairs are not being properly informed. Inefficient brake maintenance causes delays—and damaged equipment.

CARE OF MODERN PASSENGER BRAKE EQUIPMENT

The subject of the care of modern passenger brake equipment naturally divides itself into three parts, namely: Inspection; yard testing, and maintenance.

Inspection.—The inspection of the air brake equipment is an important factor and car inspectors and repairmen and air brake inspectors and repairmen should be instructed and required to pass an examination on the construction and operation of the air brake equipment in order to qualify them properly to perform their duties. Trains should be properly inspected on arrival at terminals. Local trains should be given a terminal inspection once each day.

Yard Testing.—Every passenger train, after having had its terminal inspection, should be subjected to a proper yard test. The yards should be properly piped and have compressor capacity sufficient to maintain at least 110 lb. air pressure. There should be a portable testing machine with suitable walks between the tracks to facilitate moving it about. A terminal yard handling 16 trains, averaging 8 cars each per day should have one testing machine and two men to make the tests. The code of air brake tests as compiled by the Westinghouse Air Brake Co. is satisfactory in every respect.

Maintenance.—The subject of maintenance may, for convenience in handling, be divided into three parts: Valvular mechanism; parts connected with pneumatic application, such as piping, brake cylinders and slack adjusters, and the transmission such as levers, rods, brake shoes, etc.

It has been the practice of practically all railroads to clean the triple valve every three months and the brake cylinder and slack adjuster every six months. Tests have developed that a PC control valve properly cleaned and lubricated and afforded proper protection from dirt and moisture will remain in service over a year and stand the yard test each day, and also that this same valve will pass the rack test.

All piping should be thoroughly inspected and tested. Tests have determined that if brake cylinders are properly cleaned and lubricated, particularly if they are equipped with the J-M. expander ring, they will remain in service with a minimum leakage for 18 months. Extending the time of cleaning of the control valve to six months and the brake cylinder and slack adjuster to 12 months would mean a saving of 50 per cent of the present cost of this work, and experience will probably demonstrate that a further saving may be advantageously made along these lines.

With the heavy passenger equipment now in use a properly designed clasp brake is of the utmost importance for efficient and satisfactory braking. The advantage derived by using the clasp brake is very noticeable in service, as it does away with the pulling-down effect on the truck during a brake application, making a much smoother stop. Hot boxes are eliminated to a certain extent due to an equal pressure being exerted on each side of the wheel which holds the journal in its bearing and the tendency of picking up waste between the journal and bearing is remote. The clasp brakes on our four-wheel truck cars are designed so that the automatic slack adjusters will take care of the brake shoe wear. Tests have shown that with this type of brake the life of the brake shoes is approximately 30 per cent greater, due to the low brake shoe pressure. The paper was signed by C. V. Joy.

Discussion

It was the general belief that with proper organization and competent men to test and repair the modern passenger brake equipment the time between cleaning could be increased materially. Just so long as the triples and control valves pass the tests prescribed by the M. C. B. Association they should be allowed to run. They must be tested frequently, however, and the foundation gear must be maintained in good condition. The automatic slack adjuster has an important function to perform. It, too, should not be neglected. It performs its best service with a foundation gear using the clasp type of brake. Several members were of the opinion that better results would be obtained by using no oil in any part of the triple valve. Tests made on the Central of New Jersey with 1,000 new cars, on 500 of which the triple valves were lubricated with graphite and the other 500 with no lubrication at all, showed that at the end of a year those with no lubrication had given the better service.

MOISTURE IN LOCOMOTIVE BRAKE SYSTEM

The results of investigation have shown that with adequate radiating pipe between the compressors and main reservoir and also between the main reservoirs, where more than one is used, it is absolutely necessary to thoroughly thaw and blow out the main reservoirs and piping each trip before the engines leave the roundhouse. Where this practice has been followed freezing of the pipes in severe cold weather has been eliminated, and where this has not been done the freezing has been frequent.

Temperature tests were made on a locomotive having an 8½-in. cross compound compressor located on the left side, and well forward, two main reservoirs—one on each side under the running boards and well forward of firebox—with a combined capacity of 75,000 cu. in., 45 ft. of 1½-in. discharge pipe between the compressor and the first main reservoir located under running board on left side of engine and 50 ft. of 1-in. equalizing pipe between the first and second reservoirs running from the forward end of the first main reservoir on the left side, under boiler to the right side, then forward and back under the running board connecting to the forward end of the main reservoir on the right side of the engine a 1-in. pipe extended from the back end of the second main reservoir to the engineer's brake valve. Thermometers were inserted in the piping at different points as follows: No. 1 at the point of connection of the compressor discharge pipe to the first main reservoir; No. 2 at the connection of the 1-in. equalizing pipe to the second main reservoir, and No. 3 in the 1-in. pipe between the second main reservoir and the engineer's brake valve. Other thermometers were used to determine the prevailing temperature of the air before it entered the compressor. The locomotive was standing still during the tests and there was a slight wind blowing against the right side of the engine.

The compressor was started and when the pressure had been raised from atmospheric to 90 lb., as shown by the air gages, thermometer No. 1 showed 80 deg.; No. 2, 41 deg., and No. 3, 44 deg. The engineer's brake valve was then placed in full release and the rear angle cock opened sufficiently to relieve the pressure and the compressor was run for 2 hours and 45 minutes with results shown below:

No. of Run	Time Run—Min.	Speed Single Strokes Per Min.	Temperature Degrees—F.					Air Pressure Pounds
			Atmos.*	At Strainers†	Ther. No. 1	Ther. No. 2	Ther. No. 3	
1.....	27	128	40	60	121	61	63	90
2.....	25	108	40	60	116	56	62	90
3.....	15	120	40	60	136	66	60	88
4.....	25	120	45	63	146	81	68	85
5.....	20	122	45	63	146	83	63	90
6.....	28	80	45	60	106	61	60	90
7.....	25	80	45	58	106	60	60	90

*Thermometer was located 15 ft. from the engine on the right side.
†Thermometer was located 10 in. from the strainer of the compressor.

This paper was signed by Mark Purcell.

Discussion

The climatic conditions of the district in which a locomotive is used will, to a large extent, govern the amount of radiation pipe that should be used between the compressor and the main reservoir and between reservoirs where more than one is used. That is, in the North as much radiating pipe will not be as necessary as in the South. In any case, however, the radiating pipe should be so situated that it will properly perform its function. It should be of as open construction as possible and so located that the air may flow freely around it. The practice of opening the main reservoir drain cocks as soon as the locomotive enters the

engine house and keeping them open until it goes out again was strongly recommended. The Santa Fe makes no exception to this rule even when there is no danger of the collected water freezing, lest the engine house men forget about opening drain cocks sometimes when the cooler weather comes. Two or more reservoirs were believed to be more desirable than one large one of an equivalent capacity, for the reason that they serve as catch basins and more water will be collected from the air before it passes into the train pipe.

HAND BRAKES FOR HEAVY PASSENGER CARS

The manufacturers of hand brakes have given much thought and study to the subject. The types using the tapered winding drum are believed to have considerable merit, but then suffer the same disadvantage, in many instances, as the automatic slack adjuster encountered in its earlier days because of unsuitable conditions surrounding its installation.

The question of whether it would not be better to operate a hand brake on one truck at a time has been considered, and it is believed that it will be better not to make the changes and alterations in the body brake pull rods that this method involves. The rods would be weakened and the hand brake slack would increase rapidly with the shoe wear since the automatic slack adjuster could not care for it. Hence during a goodly portion of the life of the shoe we should be about as badly off as we are now.

Much can be done in cutting down the resistance to the movement of the hand brake gear by designing the gear so that it will not bind on any part of the car framing. Perhaps no part of car truck design is so poor as the brake beam release spring. Any improvement which will permit its end to deflect through a long sweep without unduly increasing the initial resistance, which should not be more than enough to hold the brake shoes away from the wheels, in release and preventing them from dragging, would be immediately noticeable in a better hand and air brake. This paper was signed by J. P. Kelly, C. W. Martin, L. P. Streeter and F. J. Barry.

CLEANING AND REPAIRING OF FREIGHT BRAKES

The constantly increasing percentage of heavy capacity cars in service and the increase in tonnage handled per train has made a more uniform and high efficiency of brakes necessary for even distribution of brake power; thus to prevent damage from violent interchange of slack and insure quick stops when required to avoid accident. This is true of long heavy trains now handled on level districts, and particularly for safety on mountain grades and minimizing damage from over-heating due to the good brakes having to do additional work to compensate for the poor ones in the train.

To maintain the needed higher efficiency, regular and systematic inspection and repairs are necessary. A number of roads, particularly those having heavy grades to traverse, have established "Deadline" points at which trains are inspected, and if any brakes are found in poor condition, they are repaired before being allowed to proceed. The records obtained from such inspections indicate that many brakes are in poor condition, although perhaps recently cleaned and repaired.

Recent dates of cleaning, shown by stencils on many defective brakes found, indicates poor work done by cleaners. Brake cleaners cannot be criticized where adequate means for testing are not provided or where the men are not properly instructed in making brake tests and repairs or are not allowed sufficient time to do the work. One investigation showed that of 15,270 triple valves removed for all causes the defects were distributed as follows:

8,638—56 per cent—Packing ring leaking.
5,444—36 per cent—Slide valve leaking.
1,871—12 per cent—Graduating valve leaking.
1,348— 9 per cent—Piston bushing worn.
1,244— 8 per cent—Emergency valve defective.
156— 1 per cent—Feed groove defective.
274— 2 per cent—Vent valve defective.
350— 2.2 per cent—Vent valve piston defective.
196— 1 per cent—Water in triple.

The foregoing figures indicate a necessity for more and better triple valve repairs; in addition the need of systematic and continued attention to brake cylinder leakage should be emphasized. Careful tests indicate that approximately 50 per cent of inefficient freight brake is due to brake cylinder leakage.

Brakes put in good condition at the time of cleaning will, with a very few exceptions, give good service for a period of nine months to one year; but from tests made during a period of several years of brakes cleaned on several different roads, it is shown that a large percentage have to be recleaned and repaired again in from one to three months, which greatly increases the work required to keep the brakes in a reasonably efficient condition. The paper was signed by Mark Purcell.

DISCUSSION

F. B. Farmer (Westinghouse Air Brake Company), who has followed this question carefully for several years, presented a written discussion, stating in part, as follows: Experience has shown, especially on roads having heavy grades, that money spent for brakes of the proper type and for their careful maintenance has been a profitable expenditure in that fewer accidents will occur, and more tonnage per train can be handled, all without the use of hand brakes. On the level roads proper and well maintained brakes will permit of longer trains, faster time over the road and less trouble from slack action. Brake cylinder maintenance is of fundamental importance. It is one of the most important and vital parts of the air brake system. Its cleaning, lubrication and repair are almost entirely placed in the hands of the lowest paid air brakeman and too often the quantity handled by this man is the sole measure of his work. The properly maintained triple valve must accompany the properly maintained brake cylinder. With the latter and without the former the brakes will creep on, resulting in stuck brakes and slid flat wheels. The soap suds leakage test on the brake cylinder rod is a simple and reliable test which none should neglect to use.

Other members called attention to the manner in which the brake cylinder was not properly maintained. The old question of "cleaning triple valves with stencil brush" was again referred to and it was believed that this was done, particularly on those cars which had the triple valves so located that they were difficult to remove.

OTHER BUSINESS

Other papers and reports were presented on Piping of Locomotives and Cars, Excess Main Reservoir Pressure and Recommended Practices. On Wednesday afternoon a lecture on the manufacture of iron tubes was given by R. W. Kenney, of the A. M. Byers Company, Pittsburgh. Motion pictures were shown illustrating the lecture. Walter V. Turner made a novel and interesting talk on Thursday afternoon. He showed by means of motion pictures the operation and the manner in which the air flowed through the various passages of the U. C. triple valve during the charging, service application, emergency application and the releasing of the brakes. The possibilities of illustrating brake performance by this method is well worth considering in the matter of instruction. Mr. Turner also showed illustrations of various freak inventions which were both interesting and amusing. T. O. Sechrist, master mechanic, Louisville & Nashville, also addressed the association during the Thursday morning session.

The secretary reported a total membership of 1,177, and a cash balance of $1,360.90. There were 258 members present at the convention, the total attendance, including guests, being over 400. This is the largest attendance ever recorded during the history of the convention.

The following officers were elected for the ensuing year: President, T. W. Dow, Erie Railroad; first vice-president, C. H. Weaver, N. Y. C. West of Buffalo; second vice-president, C. W. Martin, Pennsylvania Railroad; third vice-president, F. J. Barry, N. Y. O. & W.; secretary, F. M. Nellis, Westinghouse Air Brake Company, and treasurer, Otto Best, Nathan Manufacturing Company.

PROPOSED AMENDMENTS TO HOURS OF SERVICE LAW

The Special Committee on Relations of Railway Operation to Legislation has issued a circular to the railroads stating that in its opinion a serious effort will be made to secure the enactment of a bill, H. R. 9216, introduced into the House of Representatives on January 17 by Representative Cullop, amending the hours of service act to prescribe a maximum limit of eight hours instead of nine hours on duty any railroad employee "who by the use of the telegraph or telephone, or other electrical device, despatches reports, transmits, receives or delivers orders, or who from towers, offices, places and stations operates signals or switches or similar mechanical devices controlling, pertaining to or affecting the movements of trains of more than two cars." The circular states that a hearing on the pending bill was had before the Committee on Interstate and Foreign Commerce on April 27, at which the argument for the railways was presented, and that an examination of the proposed legislation will indicate the extremely serious character of its provisions. To enable an additional presentation to be made of the arguments against the bill, the roads are requested to fill out blanks showing the additional number of employees that would be required, and the additional operating expenses that would be made necessary by the passage of the bill. The effect of such legislation and some of the arguments against it are stated in the commission's circular as follows:

"The effect of the bill if enacted is briefly as follows:

1. Despatchers who now work 8 hours and have an additional hour for safely making their transfers to their successors, will be restricted to 8 hours in each 24.

"2. Operators in three-men offices will be restricted to 8 hours continuous service without the additional hour now given for making transfers where necessary, or to meet the emergencies caused by illness or late arrival of succeeding operators.

"3. Operators in two-men offices will be restricted to a maximum of two periods of 8 hours continuous service each, instead of an aggregate of 18 hours as at present.

"4. Operators in one-man offices will be limited to 8 hours continuous service instead of 13 hours, with additional time in case of emergency three days in a week as at present.

"5. All employees who operate signals, switches or any mechanical devices affecting the movement of trains of more than two cars, from any tower, office, place or station, will be placed upon an 8 hour basis. This will include switch tenders in any specified location.

"6. Any train or engineman using the telephone under any circumstances, except as specified under par. 8, thereby comes under the operation of the 8 hour rule, must discontinue work at the expiration of 8 hours and may not again go on service until 16 hours have elapsed, or in case such employee uses the telephone to obtain orders, instructions or information regarding the movement of trains after he has been on duty 8 hours, a violation of the law occurs.

"7. Requires that the 8 hours on duty be continuous and that the period off duty of 16 hours must also be continuous.

"8. The only exception to this 8-hour provision is in case of collisions, derailments, slides, washouts or personal injuries. There is no exception in case of emergency or illness.

"9. The proviso in the third section as to the terms of the act in general in applying in case of casualty or unavoidable accident or the act of God, is strictly limited to train and engine employees.

"The object of the bill ostensibly is safety, and the argument used by its supporters depends wholly upon the proposition that despatchers operators, towermen, signal men, switch tenders, etc., are subjected to such a mental strain in the performance of their duties that the legislation is necessary, supplemented by the argument that communication between train and engine employees and the despatcher direct over the telephone is attended with danger.

"The bill, however, creates dangerous conditions which must result in accident and loss of life unless additional men to the number of many thousands are employed, and unless the hours of despatchers and operators in three-men towers where transfers are necessary, are cut to a point where these transfers can be safely made under the proposed law this would require a less term of duty than 8 hours. The real object of the bill therefore, is to force the employment of additional men.

"Despatchers as a general rule are not represented by the interests supporting the bill. These men now work 8 hours. To compel them to work 8 hours without any opportunity for transferring to their successors would create a situation which no management could be responsible for. It would therefore be necessary to work an additional number of despatchers a less time than 8 hours in order to secure safety. So far, therefore, as this class of employees is concerned the bill is designed simply to increase their number.

"Operators in three-men offices now work 8-hour tricks. This is also true of men in many signal towers and interlocking plants. In many of these it is necessary to provide time for making a transfer to the succeeding employees. In such cases it would be necessary to work such men a less time than 8 hours to make safe operation possible. The result here would also be simply to increase the number of men employed.

"Much stress was laid upon the strain under which operators worked. A typical statement is the following quotation:

> In regard to tuberculosis, I might explain to you that a man sitting at a telegraph instrument with his mind concentrated upon the sounder, resolved not to miss one sound made by that instrument, forgets to breath properly and lung infection comes from that fact. (Hearings, Safety on Railroads, January, 1914, Part 7, p. 453.)

"To any one having knowledge of the conditions under which operators work any statement of this kind, or any argument based upon the mental strain upon the operator, would be considered absurd, but there is no question but that such an argument has had weight with persons without any knowledge of the subject. Something might be said correctly for the strain upon despatchers, but this bill increases the difficulties under which despatchers work.

"The use of telephones by train men has been a gradual development. The history of this development is one of increased efficiency and safety in the movement of trains. In many instances train men are saved long trips to telegraph offices, and in other cases by direct communication with the train despatcher one additional possibility of error has been removed. No argument for the abolition of this practice can be based upon any considerations of safety. It is essentially a measure to increase the number of telegraph and telephone operators.

"Exceptions to the provisions of the bill so far as the operators and others using telephones are concerned are limited to cases of collision, derailment, slides, washouts or personal injury. All emergencies other than the above are stricken out. In case an operator is late in coming to work the office must close or the law must be violated, and this regardless of whether such an emergency is caused by illness or other legitimate reason.

"It is to be noted that in the original act its provisions did not apply 'in any case of casualty or unavoidable accident or the act of God.' In the proposed revision this exception is limited to employees in the train and engine service, so that in any case of unavoidable accident, such as the burning of a bridge or an act of God, the employment of an operator to exceed eight hours is still unlawful.

"It is also noted that when the original act was passed in 1907 its provisions did not require, in all probability, so large an additional number of employees as will be required under this proposed revision, but at that time the railways were given one year to comply with the provisions of the act,

and the commission was given authority to extend that time within its discretion. The proposed revision takes effect upon its passage. This will result in every railway becoming immediately a violator of the law without any opportunity to accommodate itself to its provisions should it be passed."

METHODS ADOPTED IN THE CONSTRUCTION OF ROGERS PASS TUNNEL*

By J. G. Sullivan

Chief Engineer, Western Lines, Canadian Pacific, Winnipeg, Man.

The Rogers Pass tunnel is in the Selkirk mountains of British Columbia. It is double tracked, five miles long, and lowers the summit of the line by 552 ft. It also shortens the line by 4.3 miles, eliminates some 2,300 deg. of curvature and avoids the expense and danger of maintaining and operating 4.5 miles of snow sheds.†

During the period from 1910 to 1913, the traffic of the Canadian Pacific increased so rapidly that it was evident that if the rate of increase continued, the road would have to be double tracked. The length of time required to complete the work, therefore, became a matter of anxiety to the company. Although tunnels in Europe had been driven at a rate two or three times as fast as any long tunnel had been driven on this continent it was considered unlikely that American contractors would bid at a reasonable figure on the European method, and after having studied some of the prices paid for labor on certain large Swiss and Italian tunnels, the conclusion was reached that the same methods were not practicable in this country where labor is so expensive. A. C. Dennis, however, suggested driving a pioneer tunnel and taking out an upper heading through shafts into this tunnel, taking out the rest of the bench with steam shovels. I pointed out to him that this was impracticable for the reason that from an upper heading you cannot drill to the bottom of the tunnel, and therefore would have to clean up all the muck in the bench before you could put in a round of breast holes to break more rock. The method adopted is a combination of my ideas with those of Mr. Dennis.

A pioneer tunnel was driven entirely outside the regular section of the tunnel, and a center heading was driven along

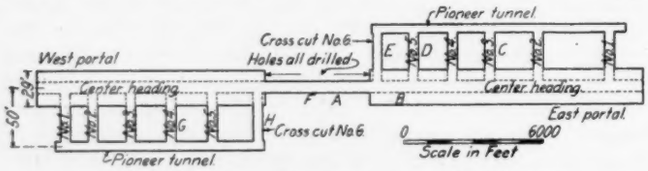
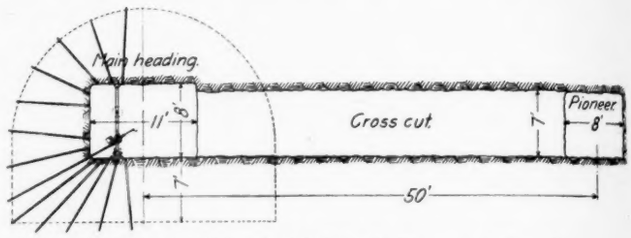


Diagram Showing Progress on April 15, 1916

the center of the main tunnel. The functions of the pioneer tunnel were to provide a means of transporting the material from the heading to a point back of where the enlargement of the tunnel was being made, and to provide for the carrying of high pressure air pipes, water pipes, ventilating suction pipes, etc., in other words, to provide a means whereby the "shooting" at any one point in the tunnel would not interfere with operations at other points.

The pioneer tunnel at the east end was located 50 ft. to the north of the center line of the main tunnel and at the west end 50 ft. to the south of it. Drilling in the small headings was done in the usual manner, using in general Leyner drills, making an advance of 6 or 7 ft. for each round of holes. The muck was shovelled by hand from steel plates into ½-cu. yd. cars and hauled back, either by a mule or by a small compressed air locomotive. The latter was used entirely when the haul had reached a considerable distance. The muck from the headings A and B on the progress diagram was carried out through the cross-cuts E and D respectively into the pioneer tunnel, where it was carried back to cross-cut C, and thence out on a trestle over the standard-gage tracks through the main tunnel, and dumped into standard-gage cars. The material was then removed to the fills as was also the muck loaded by steam shovels in the enlargement. The muck from heading F on the west end was in a similar manner conveyed into the pioneer tunnel at cross-cut H and back to the main tunnel in cross-cut G, where it was dumped into standard-gage cars. In the enlargement of the main tunnel the drilling was done well ahead of the shooting. The radial holes were at first drilled at right angles to the axis of the tunnel, but the results were not satisfactory, and a change was made to a method in which the holes have an inclination of about 1 in 4 from the



Cross Section of Main and Pioneer Tunnels

direction in which the tunnel was being driven. The muck was all loaded by steam shovels into standard-gage 12-cu. yd. capacity dump cars. The shovels had dippers of 1½-cu. yd. capacity and were operated by compressed air. The cars were hauled to the mouth of the tunnel by standard-gage compressed air locomotives and taken from there to the dumps by standard steam locomotives.

The contract for this work was let on July 1, 1913. The limit of time for completion was three and a half years, which would end on January 1, 1917. There was an allowance in extension of time of one day for every 10 ft. of soft ground encountered, which would require immediate timbering. As there was some 1,660 ft. of such ground, the time limit of the contract was extended into June, 1917.

The best progress made in driving the pioneer tunnel heading was in January, 1915, when 932 ft. in the west heading was completed. The best record for a week in the enlargement was 267 ft., and for a month 827 ft. The latter distance was accomplished during August, 1915, in the west end.

From April 1, 1915, to December 19, 1915, 12,346 ft. of tunnel enlargement was made. This was during the time that the shovels were both working in rock and at a normal rate of speed. Such a rate would require only a little over seven months in which to complete the tunnel. There will, however, be some slowing up in the enlargement between the ends of the pioneer tunnels. The methods employed in shooting in the enlargement were as follows: One round of holes was shot at a time, the holes in the bottom of the tunnel being shot in advance of the holes on the sides or on top. In some cases the top holes were not shot until all the bottom holes were finished. Usually six or seven rounds of holes were shot before the steam shovel began to take up the muck, thus making an advance of from 30 to 35 ft. The shooting was usually continued until the tunnel became so full of muck that no more shooting could be done. The best day's work was 84 ft. in 11 hours, which was the record for November 20, 1915.

The work has proceeded far enough now to state with safety that the cost of driving this tunnel through rock will amount to a little less than $5 per cu. yd. for tunnel excavation in the tunnel proper. This price includes the cost of driving 19,610 ft. of pioneer tunnel, 12 cross-cuts each 40 ft. long, the installation of the plant including freight on the same, the proportionate cost of building five miles of

*Abstract of a paper presented before Canadian Society of Civil Engineers, January 13, 1915, with supplementary data to date.

†See illustrated article in *Railway Age Gazette*, December 11, 1914, page 1082.

railway tracks, and other over-head charges, plus 10 per cent on all expenditures. This sum is just about one-half the amount bid by contractors who proposed to use the European method and who required a time limit of from 42 to 48 months.

The progress of the work up to April 15 is as follows: The drilling for the enlargement was all completed late in April. The plan was to continue the pioneer tunnels until such time that the work required to remove the center heading between the last two cross-cuts, and to drill for the enlargement between these cross-cuts, would be completed before the steam shovels had the enlargement completed up to the last cross-cut. The reason for this is that after the steam shovel passed the last cross-cut, drilling could not be done for the enlargement without carrying air pipes over the muck pile in front of the shovels. This work was carried out on schedule time with only 10 or 15 days to spare.

On April 15 the enlargement from the west end had reached a point 150 ft. east of cross-cut No. 6. The shovel doing the enlargement from the east end had reached a point 130 ft. east of cross-cut No. 6 from the east pioneer tunnel, leaving 4,604 ft. to be completed between shovels at this date. During the month of March, 1916, the steam shovel on the west end advanced 1,050 ft., or at the rate of over 2.3 miles per year in a single heading.

The work was laid out and commenced under F. F. Busteed, engineer in charge of double tracking, with J. W. Sheppard as assistant engineer. It has recently been under the supervision of W. A. James, engineer of construction western lines, with H. G. Barber as assistant engineer, T. Martin, resident engineer at the west end, and J. R. C. Macredie, resident engineer at the east end. The contractors are Foley Bros., Welch and Stewart. The construction work has been supervised for the contractors by A. C. Dennis.

REPORT OF CHAMBER OF COMMERCE COMMITTEE ON RAILROAD WAGE CONTROVERSY

As noted in a recent issue, the directors of the Chamber of Commerce of the United States on April 25 ordered a referendum of its membership on a proposal to ask Congress to call upon the Interstate Commerce Commission to investigate the questions presented by the pending controversy between the railroads and the train service employees. This referendum was proposed by a special committee of the chamber appointed in accordance with resolutions adopted at the annual meeting in February, "to investigate and consider such phases of this critical situation as relate to the interests of commerce and the public." H. A. Wheeler, vice-president of the Union Trust Company, Chicago, is chairman. In presenting the recommendation for a referendum, the committee submitted a report to the board of directors of the chamber in which it said in part:

"Your committee is profoundly impressed with the gravity of the existing situation and with the importance of having the people of the United States realize how seriously every interest will be affected by this threatened interruption of railroad traffic.

"Your committee is also convinced that notwithstanding the burdens at present resting upon the Interstate Commerce Commission there is no more important service which the commission could undertake in the public interests than that hereafter proposed, nor is there any other existing agency which enjoys the confidence of the men, the railroads and the public, and is in every respect qualified to conduct an accurate and impartial investigation of the questions involved in the present controversy."

Attached to the report is an outline of arguments which may be made both in favor of and against the committee's recommendation for an investigation by the Interstate Commerce Commission. The arguments in favor of such an investigation are stated in part as follows:

"The public has a paramount interest in having before it an authoritative and non-partisan statement of the facts regarding wages paid by the railroads to their employees.

"The public character of the railroads of the country, in which the interest of the public is uninterrupted and efficient operation is transcendent, makes it highly important that authoritative information should at once be placed before the public regarding any controversies between employers and employees out of which detriment to great national interests might come.

"Information regarding the relations of the railroads in all respects other than with their employees is available, or is being gathered; there should be no exception with respect to the relation of employer and employee.

"Information which is now made available, or is being assembled, shows the degree of safety with which railroads are operated, the equipment with which they undertake to perform their public duties, the disposal in expenses, interest, dividends, etc., of the freight charges and passenger fares they collect, and the value of the property upon which they can ask a reasonable return through their charges to the public. Nevertheless, the wages and salaries paid to their employees and officers are made public only in gross sums and in general averages, and the public has no means of knowing the purport of requests made for increased wages, and no data by which it can compare either existing or proposed wages in railroad service with wages in other occupations.

"In having railroad wages adequate to obtain efficient service and to return a proper compensation in view of American standards, and in knowing that freight and passenger revenues are not dissipated in extravagant wages, the public has a special interest, because of the service it has a right to exact and the rates it pays.

"The cost of operating a railroad, in which expenditures for wages form a great part, has repeatedly been held by the Interstate Commerce Commission to be a proper element for consideration when it is determining whether or not the rates charged for service to the public are reasonable; the element of cost of operation, however, is not necessarily controlling.

"The Interstate Commerce Commission is the proper body to make the investigation and the report proposed.

"Under a federal policy now well recognized, questions of banking and questions of railroad transportation are segregated from other questions and are referred to expert bodies. The gathering and presentation for public information of data regarding wages paid in railroad service should not be made an exception to this policy, but should be placed with the Interstate Commerce Commission.

"No other independent federal agency organized to be non-partisan and with a record of actual abstention from partisanship is prepared to undertake the immediate investigation proposed. No new agency could be created which would command the same respect from all parts of the public or which could proceed without delay. The Interstate Commerce Commission is so well equipped to undertake the task in question that the commission would be justified, in the event it found such a course necessary, in temporarily ceasing from some of its usual activities in order that it might assume this investigation."

The following is an abstract of the arguments against such a proposal as outlined in the report:

"The Interstate Commerce Commission already has too much work and should not be asked to assume more duties.

"Wages are connected with operation; the commission has never had jurisdiction with respect to operation, and consequently is not especially prepared for the task.

"The usefulness of the commission in performing its present duties could not be increased by the inquiry proposed, and it might be impaired.

"Congress is expected to enact at this session a provision for an investigation of the conditions relating to interstate commerce and the necessity of further regulation."

General News Department

The triennial convention of the Grand Division of the Order of Railway Conductors was opened at St. Louis on May 7. The convention will last about three weeks.

The Boston & Maine last week made trials, on its Watertown branch, near Boston, of an automatic train stop, said to have been invented by one of the tower-men of the road.

At a fire on the piers of the Florida East Coast Railway at South Jacksonville, Fla., on the evening of May 7, lumber, barges, and other property valued in the aggregate at $100,000 were destroyed.

Salaries have been increased on the Illinois Central as follows: Trainmasters to $190; chief despatchers to $165; night chiefs to $155; main line despatchers to $145, and branch line despatchers to $135.

The bill to increase the number of Interstate Commerce Commissioners from seven to nine has been acted on favorably by the Senate Committee on Interstate Commerce. Similar favorable action was taken in the House some time ago.

The London & North-Western (England) on May 1 discontinued the running of restaurant and dining cars on its entire system of over 3,000 miles. The Great Western is taking off restaurant cars on the routes to Birmingham and the north, and it is supposed that other railway companies will also discontinue the use of dining cars on the grounds of economy.

S. E. Cotter, general manager of the Wabash Railroad has been appointed a member of the Conference Committee of Managers representing the railroads of the United States, to conduct negotiations with the committee representing the train service brotherhoods regarding their wage demands. When the list of members of the committee was announced last week there was one vacancy among the western members of the committee.

The special commission of the state of Georgia, appointed to consider matters connected with the re-leasing of the Western & Atlantic, which is now operated by the Nashville, Chattanooga & St. Louis, will hold hearings beginning May 18 to listen to suggestions as to the best use to be made of certain portions of the line; as to the extension to the sea, taxation by the counties and municipalities through which the road runs, improvements, etc.

The Cleveland, Cincinnati, Chicago & St. Louis has issued a small card for distribution in cities along its line showing how much money the company is expending in those cities in wages. The cards show the number of heads of families employed in each city, the number of persons dependent upon these employees, and the total monthly pay roll. This road has also sent to newspapers a statement showing the highest wages paid per month in both freight and passenger service to train employees, for each division of the road.

Governor Calles, of the State of Sonora, Mexico, has issued a decree declaring annulled all of the public service concessions and franchises in Sonora, and it is said that it embraces the Southern Pacific Railroad Company of Mexico. The concession for the construction of this road was granted by the national government of Mexico, but the line is operated under certain rights that were granted by the different State governments. The efforts that were being made to open this road for through traffic have again been temporarily abandoned on account of the dangerous condition of the coast region, where many bands of brigands are still at large. The physical condition of the property has deteriorated greatly during the long period of the war-disturbances.

The New York legislature has passed a law, already signed by the governor, amending section 1982 of the general penal law relating to illiteracy, so as to forbid the employment of persons who cannot read and write, in the position of engineman, assistant engineman, fireman, engine foreman, hostler, trainman or flagman. The requirement is that the person must be able to read the time tables and ordinary handwriting in the English language. This section now, as heretofore, forbids the employment of persons under 18 years old as telegraphers in the transmission of train orders. The word "flagman" is not to be taken to apply to flagmen at street crossings. The amendment goes into effect September 1.

1,819 Miles in 24 Hours

At Sheepshead Bay Speedway (New York) last week Tuesday, Ralph Mulford, driving a Hudson Super Six automobile, traversed 1,819 miles in 24 hours, averaging 75.79 miles an hour for the entire distance. The car used is the same one that showed a speed of 102.22 miles an hour on Ormond Beach recently. Mulford made 11½ miles to a gallon of gasolene used. Except for stops for fuel every 150 miles, his only stops were to shift a tire (as a precaution), change some spark plugs, and once to clean out the carbureter.

The makers of the tires used on the car with which this run was made, in full page advertisements, call attention to the fact that a distance of 1,520 miles was made without changing a tire, and at the rate of 76.5 miles an hour. In this distance Mulford made 10 stops, fewer, in proportion, than the number made by the 20-hour express trains between New York and Chicago. Mulford's speed was about 50 per cent higher than that of the Twentieth Century Limited, and for a distance more than 50 per cent greater than the run of that train.

Plans for the Roadmasters' Convention

Plans are rapidly developing for the annual convention of the Roadmasters' and Maintenance of Way Association, which will be held at the McAlpin hotel, New York, on September 19 to 22, 1916. The twenty-fourth floor of this hotel has been reserved for the convention and the exhibit of the Track Supply Association. Although invitations will not be sent out to the exhibitors for a few days, several unsolicited applications for space have already been received. From present indications there will be more applications for exhibitors' space than can be accommodated. While the complete program for the convention has not yet been prepared, the annual banquet will be held on Thursday evening, with several prominent railway men as speakers. On the afternoon preceding the banquet, a special train will convey the members on an inspection trip over the lines of the Long Island Railroad.

Land Valuation

The land sub-committee of the Presidents' Conference Committee on the Federal Valuation of Railroads has issued a bulletin containing suggestions to the railways to aid them in complying with Interstate Commerce Commission order No. 7, which requires the roads to make a statement of all lands owned or used for their purposes as common carriers, and also for purposes other than those of a common carrier. Two forms are provided on which this land is to be listed according to the purposes for which it is held. This bulletin contains detailed suggestions regarding the manner in which these forms should be filled out to comply with the requirements of the government, and to give it the desired information.

President of Brotherhood of Railroad Trainmen Opposed to Arbitration

The Cleveland Leader of May 2, quoted W. G. Lee, president of the Brotherhood of Railroad Trainmen, as declaring in a statement that he is unequivocally opposed to arbitration of the controversy between the trainmens' organization and the railroads over the demands for the basic 8-hour day and time and a half for overtime, and that he would not accept arbitration unless forced to do so by a vote of the men or the passage by

congress of a law making arbitration compulsory. "I will advocate the placing of the question on the inevitable strike ballot," Mr. Lee was quoted as saying. "I am opposed to arbitration because that would mean splitting the difference; perhaps not even that. In every arbitration that we have had the men have got the worst of it. In the western arbitration the man appointed by the federal board as neutral was not neutral at all, but was interested in railroads."

To Investigate Foreign Markets for Railway Supplies

The Bureau of Foreign and Domestic Commerce will hold examinations in various cities of the country, on May 19, for a special agent to investigate the markets for railway supplies in South America and for a similar agent to investigate the markets for railway supplies in Africa, Australasia and the Far East. The salary for both positions will not exceed $10 a day for every day in the year, and actual transportation and subsistence expenses will be paid, not to exceed $5 daily. The examinations will consist of practical questions to test the applicant's knowledge of the subject and of methods of investigation, and a statement will be required of his experience and education. Applicants for the position of special agent to investigate conditions in South America will also be tested on their knowledge of Spanish and Portuguese.

The applicant's ability to write good English is judged on the basis of these written examination papers. In addition to the qualifications which the written examination will bring out, applicants should have good address and appearance, and be able to address public gatherings. Applicants must be American citizens. Applications for the position should be made direct to the Bureau of Foreign and Domestic Commerce, Washington, D. C., giving a complete statement of the applicant's education, and particularly his experience in the subject to be investigated, and inclosing an unmounted photograph taken within two years. Applicants who successfully pass the written examinations may be required to appear before an oral examining board in Washington.

The Public Pays the Bill

W. A. Webb, chief operating officer of the Missouri, Kansas & Texas, has issued a circular, headed as above, addressed to patrons of the road regarding the wage demands of the trainmen and enginemen, citing actual figures as to the earnings of freight train crews in actual service on various lines of the system, together with the earnings of these same crews, if their demands were allowed. Changes are made in the circulars for distribution in various districts, so that in each case they will give the figures for crews working in the district in which they are circulated. The following is an extract from the circular:

"The following is an illustration of what the present demands mean:

"Local trains Numbers 96 and 97 operate daily, except Sunday, between Greenville and Hughes Springs. Two crews are assigned to these runs. Each crew consists of an engineer, a fireman, a conductor and three brakemen. During the month of October, 1915, the two crews each worked 26 days.

"The two conductors were paid a total of $363.75, an average of $181.88 each—or $6.99 per man per day.

"The six brakemen were paid $727.60, an average of $121.27, each—or $4.66 per man per day.

"The two engineers were paid $423.55, an average of $211.77 each—or $8.14 per man per day.

"The two firemen were paid $269.35, an average of $134.67 each—or $5.18 per man per day.

"For the same identical service performed by these two crews, were the demands which have been made, in effect, the following amounts would have to be paid:

Occupation	Wages for 26 days' work	Average per day	Increase over present pay	Per cent of increase
Each conductor	$283.65	$10.91	$101.77	56
Each brakeman	189.20	7.28	67.93	56
Each engineer	325.50	12.52	113.73	54
Each fireman	207.77	7.99	73.10	54

"The only way in which the management could escape *any portion* of this increase would be by putting on one, and possibly two, additional crews, for the purpose of eliminating, so far as possible, the payment of overtime at the rate of time and one-half. Such action would reduce the average wages per man below the present level, notwithstanding it would increase the total wage expense of the railroad on these runs approximately 35 per cent.

"These men did not work Sundays. The performance of Sunday work is optional with them, and if performed, they are paid for it separately. During the 26 days they worked, the conductors and brakemen were paid for an average of 14 hours and 31 minutes, and the engineers and firemen 14 hours and 51 minutes service daily.

"Runs of this character are 'advertised' by the management, and are manned by the oldest men in service 'bidding' for them. These particular runs were chosen by senior men in preference to other runs, on which fewer hours of service per day are required, evidently because these runs pay more money.

"Is not this conclusive evidence that the amount of money which can be earned on a run, rather than the number of hours of service required, is the determining factor with the men in choosing a run; and does not this prove that what they actually desire in the present movement is *increased wages* instead of decreased hours?

"The majority of you are personally familiar with the nature of the work performed by trainmen and enginemen, and can compare it, from a standpoint of ardousness, with the work performed by men in other lines of endeavor. . . ."

Monument to the Lexington & Ohio

F. Paul Anderson, dean of the College of Mechanical & Electrical Engineering of the State University of Kentucky, Lexington, announces that on Tuesday, May 30, the college proposes to dedicate at Lexington a monument to early American railroading; the monument to be in the shape of a section of the original track of the Lexington & Ohio Railroad, the first railroad built west of the Allegheny Mountains. About 25 feet of the original track, made up of materials which have recently been unearthed, will be set in a concrete base on the campus of the university, and with it a bronze tablet bearing the following inscription:

> This restoration of a portion of the original track of the Lexington and Ohio (now Louisville and Nashville) Railroad, laid at Lexington in 1831, is dedicated to those men of forethought and courage who were pioneers in railroad development in America.
> Erected Anno Domi
> MCMXVI.

The sleepers of this track consisted of longitudinal stone "sills," and the rails were of wrought iron, half an inch thick, three inches wide and 14 feet long. The ends of the rails were miter jointed and were secured by spikes driven into lead-filled holes which had been drilled in the stone. Railroad officers and everybody interested will be welcomed at the dedication.

Professor V. E. Muncy has gathered a large amount of interesting history of the old railroad which is to be celebrated. The first stone sill was laid October 21, 1831, and the railroad was opened August 12, 1832. The cars were drawn by horses. In March, 1833, a length of six miles was in operation, and "the car, usually filled with passengers, was run regularly three times a day, each way." About this time a steam locomotive, built by a Mr. Bruen, was in use; and on January 31, 1835, "an elegant new locomotive of improved model" was running between Lexington and Frankfort. About a year later, as appears from newspaper accounts, horses were again put in use for hauling the passenger cars, the locomotive being not sufficiently reliable for passenger service. It was, however, continued in use for hauling freight cars.

The average annual receipts of the road for passenger and freight transportation during four and one-half years, ending in 1847, were $45,940; average annual profits, $20,650. After various financial vicissitudes, the road was consolidated with another line to make a through line between Louisville and Lexington, and the first through train between those cities ran over the road in 1857. Later it became the Louisville, Cincinnati & Lexington Short Line; and control was transferred to the Louisville & Nashville in 1881.

American Railway Association

In the item in the *Railway Age Gazette* of April 28, announcing the spring session of the American Railway Association at the Hotel Biltmore, New York, the date was incorrectly given as May 11. The correct date is May 17.

REVENUES AND EXPENSES OF RAILWAYS

Month of February, 1916

Name of road.	Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.	Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
St. Louis Southwestern of Texas	811	$222,568	$60,114	$310,385	$62,321	$96,105	$13,481	$160,438	$1,292	$18,874	$348,831	—$38,446	$16,776	—$55,323	—$24,818
San Antonio & Aransas Pass	724	172,868	57,596	253,105	65,068	52,431	7,431	137,443	.....	12,872	274,852	—21,747	12,000	—33,753	—24,737
San Pedro, Los Angeles & Salt Lake	1,154	585,663	157,759	818,641	94,181	135,251	32,604	266,821	18,143	17,995	564,799	253,842	44,848	208,955	83,723
Seaboard	3,449	1,573,696	488,918	2,289,728	252,841	306,446	72,947	740,621	18,159	59,185	1,450,199	839,529	101,250	737,462	.....
Southern	7,022	3,897,730	1,208,278	5,627,162	676,546	876,523	159,379	1,890,129	35,516	168,850	3,796,850	1,830,168	247,029	1,581,181	862,017
Southern Pacific	6,952	5,671,283	1,892,209	8,315,498	1,148,037	1,516,218	165,486	2,762,449	139,050	226,468	5,938,245	2,377,253	422,040	1,953,698	27,345
Spokane, Portland & Seattle	555	235,531	75,536	375,743	47,185	39,997	7,861	108,984	3,363	15,129	222,300	153,443	53,400	99,967	58,773
Staten Island Rapid Transit Co	11	49,720	20,306	94,171	13,298	7,085	671	48,357	.....	1,874	71,284	22,887	5,550	17,387	—3,405
Tennessee Central	294	85,854	25,479	119,244	24,435	18,138	5,456	46,194	.....	6,370	100,589	18,655	4,681	13,934	13,461
Terminal R. R. Ass'n of St. Louis	37	.....	260	280,107	32,677	19,149	946	92,256	.....	4,070	149,098	131,009	27,486	103,523	24,151
Texas & New Orleans	468	232,853	80,001	354,845	61,144	69,456	8,400	117,361	11,291	9,435	276,929	77,916	19,816	57,835	58,479
Texas & Pacific	1,944	1,079,170	289,367	1,488,271	182,480	249,494	38,224	589,153	15,567	61,479	1,135,312	352,960	68,700	284,205	—13,500
Toledo & Ohio Central	436	387,565	41,794	449,112	49,813	109,212	6,948	168,163	1,538	9,584	345,258	103,854	23,501	80,000	81,311
Toledo, Peoria & Western	248	57,001	34,033	96,570	12,675	31,143	2,037	35,425	.....	3,591	84,870	11,700	6,500	5,200	9,408
Toledo, St. Louis & Western	451	399,471	24,510	449,539	41,792	62,527	16,219	168,660	.....	7,853	297,049	152,490	17,400	135,090	20,342
Ulster & Delaware	129	30,252	9,680	54,896	6,401	7,723	947	25,417	144	3,456	44,088	10,808	3,500	7,312	24,449
Union Pacific	3,622	3,807,236	705,985	4,954,142	413,446	682,610	89,422	1,196,861	65,695	103,385	2,551,170	2,402,972	210,700	2,191,146	1,388,368
Union R. R. of Baltimore	8	104,731	21,798	128,404	10,584	.....	.....	5,054	.....	2,110	17,747	110,657	5,723	104,934	466
Union R. R. of Pennsylvania	31	.....	.....	362,369	22,979	96,541	108	170,072	.....	3,895	293,595	68,774	7,000	61,774	122,498
Vandalia	917	746,786	190,179	1,050,127	182,089	203,346	23,430	395,449	10,345	23,194	837,852	212,275	36,687	175,290	71,169
Vicksburg, Shreveport & Pacific	171	87,674	32,934	136,661	20,380	23,652	4,022	42,770	2,062	5,161	98,048	38,613	8,180	30,433	46,241
Virginia & Southwestern	225	141,639	11,108	156,884	24,923	35,629	2,546	44,611	.....	3,409	111,118	45,766	7,498	38,268	30,380
Virginian	505	649,341	28,574	715,043	61,273	108,299	5,242	132,050	13,172	17,149	337,096	377,947	26,500	351,436	208,430
Wabash	2,519	2,182,874	435,089	2,833,995	251,205	450,406	90,880	1,097,898	13,764	66,257	1,969,201	864,794	90,261	773,614	495,403
Washington Southern	36	47,943	67,518	151,179	11,580	15,785	1,551	46,411	2,015	3,403	80,745	70,435	4,270	66,164	40,438
West Jersey & Seashore	358	195,107	233,569	467,253	89,640	80,438	10,446	226,226	2,279	16,144	425,173	42,080	36,358	5,642	67,898
Western Maryland	689	690,386	59,728	800,273	98,743	127,272	20,364	268,709	9,767	20,874	544,475	255,798	29,000	226,798	131,229
Western Pacific	941	423,484	41,537	500,266	81,161	58,723	17,947	184,905	7,956	17,214	367,907	132,359	30,090	102,046	79,214
Western Ry. of Alabama	133	63,797	31,946	107,550	18,969	20,021	5,895	31,019	1,773	4,397	82,074	25,477	5,341	19,575	14,367
Wheeling & Lake Erie	512	584,141	42,954	682,833	71,057	104,431	7,976	229,744	1,439	15,042	429,688	253,145	39,346	213,798	210,947
Yazoo & Mississippi Valley	1,382	786,101	154,857	994,172	193,023	174,457	20,998	359,843	1,481	30,400	779,865	214,307	52,000	162,209	—122,159

Eight Months of Fiscal Year 1916

Alabama & Vicksburg	143	$742,432	$281,337	$1,120,515	$134,778	$237,591	$30,268	$381,371	$16,850	$43,763	$844,598	$275,917	$70,725	$205,192	$151,627
Alabama Great Southern	309	2,586,403	748,713	3,596,801	327,161	861,485	103,926	1,054,249	24,563	70,338	2,439,979	1,156,822	129,105	1,027,628	444,523
Ann Arbor	294	1,262,793	373,458	1,747,032	157,736	255,931	37,886	633,515	3,805	86,240	1,175,114	571,918	105,970	465,497	125,651
Arizona Eastern	378	1,603,800	266,694	1,993,707	325,249	200,270	18,231	443,309	9,629	84,112	1,079,084	914,623	151,365	763,199	429,496
Atchison, Topeka & Santa Fe	8,620	47,409,421	19,070,165	72,837,553	9,758,771	11,118,175	1,586,948	19,721,754	.....	1,527,606	43,572,874	29,264,678	3,511,688	25,733,249	5,337,360
Atlanta & West Point	93	475,207	310,905	905,734	108,770	173,016	47,546	263,390	16,265	35,889	644,713	261,021	48,159	208,889	122,045
* Atlanta, Birmingham & Atlantic	640	376,513	74,802	487,523	76,895	91,068	27,193	190,911	56	17,826	403,950	83,573	26,200	57,373	.....
Atlantic & St. Lawrence	167	932,803	187,944	1,213,925	178,169	189,361	30,954	537,126	.....	33,749	969,359	244,566	92,040	152,513	2,869
Atlantic City	170	592,541	1,002,325	1,680,349	269,316	151,078	25,274	826,849	797	12,383	1,285,692	394,657	80,000	314,485	121,011
Atlantic Coast Line	4,700	14,719,894	5,376,249	21,831,358	2,904,196	3,647,626	463,114	7,258,216	75,768	579,763	14,913,019	6,918,339	1,183,000	5,725,008	1,838,184
Baltimore & Ohio	4,535	57,589,231	9,911,370	72,809,768	8,154,469	15,348,296	1,286,236	23,788,671	430,743	1,618,203	50,622,251	22,187,517	2,332,113	19,836,911	5,609,356
Baltimore & Ohio Chicago Terminal	79	.....	4,504	1,137,067	123,931	138,609	7,257	527,631	13,191	57,297	840,727	296,340	142,212	152,655	5,522
Baltimore, Chesapeake & Atlantic	88	464,668	283,611	782,108	56,413	247,882	11,414	421,495	.....	25,485	762,670	19,439	17,912	1,520	—79,666
Bangor & Aroostook	632	1,766,295	438,409	2,345,464	364,596	391,358	22,311	663,949	24,862	89,652	1,556,084	789,380	101,750	687,608	22,035
Belt Ry. Co. of Chicago	31	.....	.....	1,901,578	141,565	233,113	6,827	830,793	.....	47,632	1,259,931	641,647	92,586	549,061	—402,002
Bessemer & Lake Erie	205	7,036,168	256,519	7,429,822	544,887	1,319,863	76,850	1,649,419	.....	120,747	3,630,779	3,799,043	144,642	3,654,380	1,317,493
Bingham & Garfield	27	1,285,632	26,081	1,319,583	130,458	123,138	8,310	174,806	755	18,260	455,727	863,857	35,240	828,616	415,133
Boston & Maine	2,302	20,516,834	10,243,087	33,863,285	4,087,429	4,305,762	271,409	14,168,904	130,067	818,074	23,781,644	10,081,641	1,313,961	8,767,680	3,134,280
Buffalo & Susquehanna R. R. Corporation	253	1,097,197	54,073	1,167,817	161,610	283,982	8,623	312,213	.....	44,749	811,177	356,641	20,800	335,839	201,120
Buffalo, Rochester & Pittsburgh	586	6,889,686	765,249	7,923,609	1,151,560	1,794,665	93,318	2,467,305	9,645	176,115	5,692,608	2,231,001	160,000	2,070,907	544,308
Canadian Pacific Lines in Maine	233	929,198	140,670	1,143,142	167,408	141,967	41,537	469,910	.....	29,621	850,443	292.698	96,000	196,698	215,994
Carolina, Clinchfield & Ohio	283	1,665,088	140,729	1,842,858	182,662	228,210	74,524	324,324	.....	74,326	875,958	966,900	114,000	852,792	258,432
Carolina, Clinchfield & Ohio of S. C.	18	94,244	11,034	108,227	9,543	650	14,322	19,281	.....	5,956	49,475	58,752	6,000	52,752	15,044
Central of Georgia	1,924	5,566,699	2,101,968	8,510,461	1,113,331	1,399,027	284,903	2,770,851	9,852	305,002	5,877,165	2,633,296	425,567	2,201,291	434,875
Central of New Jersey	681	16,642,979	4,191,043	22,154,118	1,767,952	3,839,418	248,845	7,596,652	106,927	460,805	14,017,904	8,136,214	1,255,237	6,880,473	1,443,322
Central New England	304	2,757,660	302,709	3,199,040	351,630	272,763	9,317	969,791	.....	39,328	1,641,982	1,557,058	104,400	1,452,629	739,751
Central Vermont	411	1,916,381	62,364	2,774,390	311,598	447,602	68,876	1,193,827	17,421	58,265	2,097,590	676,800	124,820	551,948	252,618
Charleston & Western Carolina	343	917,704	213,405	1,216,612	211,421	152,485	26,477	397,414	.....	37,949	825,410	391,202	40,000	351,075	186,331
Chesapeake & Ohio Lines	2,374	25,622,861	3,984,927	31,547,947	3,574,802	6,890,268	421,285	9,032,503	176,401	605,722	20,690,391	10,857,556	1,015,720	9,832,490	3,271,787
Chicago & Alton	1,052	7,307,314	2,620,673	10,762,624	1,233,280	2,310,647	282,203	3,646,421	77,748	240,980	7,736,813	3,025,811	350,846	2,671,059	829,712
Chicago & Eastern Illinois	1,282	8,609,621	1,973,266	11,476,319	1,483,883	2,713,687	196,920	3,920,189	61,594	306,691	8,662,296	2,814,024	452,400	2,358,307	399,119
Chicago & Erie	270	4,233,328	394,559	5,028,555	453,257	488,897	136,950	1,872,382	17,581	112,027	3,072,016	1,956,540	175,943	1,780,597	874,440
Chicago & North Western	8,108	39,584,576	14,447,123	60,194,124	7,242,378	9,735,212	874,722	21,091,349	826,994	1,227,433	40,435,632	19,758,493	3,080,000	16,667,089	2,876,662
Chicago, Burlington & Quincy	9,369	47,664,811	14,567,029	68,472,184	6,869,207	10,089,000	1,014,679	20,095,714	559,865	1,321,198	39,949,663	28,522,521	2,884,380	25,638,141	4,769,525
Chicago Great Western	1,435	6,991,414	2,222,296	10,064,030	1,282,928	1,680,096	359,868	3,521,011	67,919	269,867	7,170,098	2,893,932	366,556	2,521,472	467,150
Chicago, Indianapolis & Louisville	622	3,382,859	1,223,809	4,996,546	547,853	811,709	154,615	1,691,262	1,923	147,011	3,349,750	1,646,796	217,965	1,428,495	492,894
Chicago Junction	13	.....	.....	1,511,108	166,253	140,084	8,597	809,710	.....	42,910	1,167,554	343,554	27,742	315,800	120,364

* Figures for two months ended Feb. 29, 1916.

REVENUES AND EXPENSES OF RAILWAYS

EIGHT MONTHS OF FISCAL YEAR 1916—CONTINUED

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance of										
		Freight.	Passenger.	Total (inc. misc.)	Way and structures.	Equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Chicago, Milwaukee & St. Paul	10,193	$50,030,975	$12,614,187	$69,747,012	$6,295,523	$10,818,532	$1,205,156	$25,051,038	$512,988	$1,266,883	$44,124,754	$25,622,258	$3,545,180	$22,056,113	$5,910,524
Chicago, Peoria & St. Louis	255	905,477	196,663	1,167,628	171,327	225,882	45,310	470,259	.....	42,904	955,682	211,945	37,698	174,247	56,477
Chicago, Rock Island & Gulf	477	1,554,273	431,608	2,157,055	324,411	261,626	76,815	720,532	13,940	64,644	1,461,830	695,225	76,703	617,975	84,600
Chicago, Rock Island & Pacific	7,663	32,177,751	12,404,502	48,249,192	7,080,568	8,470,624	1,099,898	17,739,508	366,855	1,238,865	35,955,024	12,294,169	2,367,750	9,922,030	322,760
Chicago, St. Paul, Minn. & Omaha	1,753	8,510,069	3,486,795	12,968,648	1,563,971	1,634,380	234,150	4,786,303	124,130	308,803	8,637,731	4,330,917	682,508	3,645,666	316,875
Chicago, Terre Haute & Southeastern	373	1,566,665	130,630	1,740,000	211,483	336,159	31,736	508,614	8,104	68,077	1,164,173	575,827	83,333	492,463	205,137
Cincinnati, Hamilton & Dayton	622	5,525,580	970,250	7,239,292	1,138,009	1,447,495	135,292	2,578,956	26,783	177,670	5,492,872	1,746,420	258,916	1,486,119	857,703
‡ Cincinnati, Indianapolis & Western	322	378,059	119,941	546,503	44,940	84,460	14,678	254,279	848	20,774	419,205	127,298	28,958	98,340	.....
Cincinnati, New Orleans & Texas Pacific	337	5,454,817	1,202,340	7,068,020	697,481	1,761,545	198,580	2,036,217	43,176	163,997	4,900,865	2,167,156	252,000	1,914,734	583,453
Cincinnati Northern	246	995,705	144,896	1,190,354	198,157	187,601	21,443	379,456	.....	24,635	811,292	379,062	44,371	334,618	86,365
Cleveland, Cincinnati, Chic. & St. L.	2,385	20,006,622	6,037,466	28,445,485	2,971,103	5,212,896	591,826	9,493,707	195,063	592,063	18,987,600	9,457,885	1,016,131	8,434,699	3,372,296
Colorado Midland	338	851,432	132,029	1,068,092	168,390	254,354	57,155	450,503	9,063	44,415	983,831	84,212	70,610	13,602	—101,345
Colorado & Southern	1,102	4,546,030	936,379	5,885,111	725,736	1,130,117	76,368	1,646,938	32,794	184,941	3,796,894	2,088,217	280,000	1,807,950	499,056
Cripple Creek & Colorado Springs	87	758,331	178,944	952,877	125,158	100,527	30,428	235,911	.....	27,369	519,392	433,485	41,055	392,429	.....
Cumberland Valley	164	1,734,317	441,911	2,288,483	235,524	226,813	33,182	691,234	7,058	68,556	1,258,430	1,030,053	47,191	982,860	482,400
Delaware & Hudson Co.—R. R. Dept.	886	14,314,637	1,993,436	17,217,617	1,381,951	2,586,528	211,185	5,534,212	146,757	545,188	10,386,587	6,831,030	423,858	6,404,982	1,887,321
Delaware, Lackawanna & Western	957	23,698,793	5,727,319	32,503,627	2,929,278	4,768,757	578,499	10,082,208	245,963	641,055	19,207,474	13,296,153	1,400,734	11,894,341	2,851,442
Denver & Rio Grande	2,566	12,220,434	3,503,521	16,971,117	1,799,238	2,790,673	317,856	4,539,590	322,103	401,264	10,170,723	6,800,393	727,000	6,072,119	1,769,479
Denver & Salt Lake	255	1,088,278	220,850	1,367,815	156,762	263,674	15,361	489,968	.....	36,999	962,653	405,162	61,464	343,536	15,537
Detroit & Mackinac	393	477,471	211,109	743,967	80,679	127,549	15,614	263,316	892	21,347	509,397	234,570	65,450	165,821	30,552
Detroit & Toledo Shore Line	81	1,109,974	.....	1,117,153	97,558	63,356	12,043	290,585	.....	21,660	485,201	631,952	44,966	586,986	136,642
Detroit, Grand Haven & Milwaukee	191	1,420,001	409,439	2,116,531	196,867	261,936	42,792	972,496	5,481	33,976	1,513,547	602,984	30,160	572,243	380,842
Detroit, Toledo & Ironton	441	1,235,270	112,432	1,443,713	153,066	193,283	31,506	612,369	.....	48,104	1,038,328	405,385	45,500	359,851	360,119
Duluth & Iron Range	288	3,774,973	160,022	4,063,602	414,371	553,524	10,442	990,874	10,252	88,371	2,067,832	1,995,770	221,104	1,773,579	849,173
Duluth, Missabe & Northern	399	6,531,982	212,346	7,050,012	730,880	862,470	18,816	1,167,616	55,374	110,301	2,945,456	4,104,556	397,319	3,707,237	2,367,933
Duluth, South Shore & Atlantic	630	1,495,010	588,945	2,284,560	356,425	275,701	59,179	808,972	29,234	76,130	1,605,641	678,919	171,868	506,840	286,740
Duluth, Winnipeg & Pacific	187	818,659	148,956	1,001,723	97,339	111,081	12,992	378,545	5,460	46,871	652,287	349,436	50,162	299,275	157,283
El Paso & Southwestern Co.	1,027	5,212,715	1,071,784	6,680,924	952,607	889,104	146,801	1,669,518	51,384	231,653	3,940,941	2,739,983	313,669	2,426,012	768,653
Elgin, Joliet & Eastern	781	7,916,081	89	8,451,180	591,601	1,460,777	52,886	2,305,782	.....	180,564	4,591,074	3,860,106	305,514	3,554,402	1,905,905
Erie	1,988	33,167,024	6,169,653	43,265,772	3,229,101	6,730,865	722,116	14,943,245	267,524	894,661	26,724,205	16,541,568	1,328,294	15,177,837	7,642,297
Florida East Coast	745	2,307,272	1,196,686	4,008,273	517,959	492,807	76,291	1,270,371	24,238	154,543	2,513,864	1,494,409	186,966	1,307,199	461,489
Fort Worth & Denver City	454	2,783,646	1,079,420	4,065,064	459,769	643,103	51,679	1,180,725	21,487	125,402	2,482,164	1,582,900	138,963	1,443,937	387,506
Galveston, Harrisburg & San Antonio	1,351	5,885,351	2,073,838	8,438,695	1,218,252	1,149,564	240,063	3,141,386	86,063	257,751	6,078,419	2,360,276	402,439	1,952,838	858,897
Galveston Wharf	13	.....	.....	916,275	36,515	16,770	3,130	251,261	338,541	3,119	649,337	266,938	76,090	190,848	—320,119
Georgia	307	1,398,369	528,187	2,084,153	183,296	332,489	100,320	812,045	758	60,095	1,488,196	595,957	115,064	480,088	198,479
Georgia, Southern & Florida	395	968,989	465,200	1,645,128	181,493	283,340	54,652	605,949	1,355	75,343	1,202,000	443,127	87,519	354,615	189,967
Grand Rapids & Indiana	575	2,324,657	1,106,620	3,726,464	397,171	595,248	85,521	1,474,884	13,968	119,262	2,686,053	1,040,411	176,466	862,210	166,469
Grand Trunk Western	347	4,126,930	1,145,847	5,648,651	560,479	885,881	124,808	2,037,797	43,332	104,890	3,757,188	1,891,463	263,760	1,627,226	1,269,822
Great Northern	8,102	40,080,124	9,320,940	54,338,974	4,670,776	5,516,918	739,064	14,632,352	585,346	882,945	26,923,097	27,415,877	3,372,523	24,040,245	3,257,175
Gulf & Ship Island	308	956,967	237,003	1,296,028	117,895	209,710	23,931	316,391	2,252	57,089	727,268	568,760	56,352	512,136	247,804
Gulf, Colorado & Santa Fe	1,938	7,961,709	2,133,039	10,693,995	2,076,460	1,580,359	233,197	4,636,179	.....	308,434	8,798,987	1,895,009	495,833	1,395,691	—2,157,045
Hocking Valley	350	3,925,784	583,500	4,855,711	482,252	987,771	66,715	1,402,439	.....	114,223	3,053,401	1,802,311	310,800	1,491,420	424,919
Houston, East & West Texas	191	683,599	228,987	974,314	203,107	140,243	16,267	321,721	5,211	25,597	711,441	262,872	32,743	229,844	95,164
Houston & Texas Central	895	3,245,632	983,176	4,573,417	684,920	668,681	126,871	1,539,387	45,085	149,987	3,209,663	1,363,754	239,336	1,122,710	210,418
Illinois Central	4,767	33,304,168	9,097,145	45,848,565	6,508,701	10,984,984	832,177	14,576,274	241,596	1,159,099	34,223,819	11,624,746	2,350,500	9,259,410	1,038,325
Indiana Harbor Belt	110	.....	.....	2,572,661	268,878	234,695	22,321	1,029,534	.....	63,627	1,619,055	953,606	60,812	891,567	312,654
International & Great Northern	1,160	4,597,114	1,237,142	6,314,258	966,956	1,038,872	164,257	2,480,340	26,000	231,512	4,801,574	1,512,684	278,795	1,232,257	449,160
Kanawha & Michigan	177	2,097,848	248,381	2,405,934	326,664	481,212	24,986	615,740	97	54,029	1,502,728	903,206	106,135	796,729	341,593
Kansas City, Mexico & Orient	738	1,421,590	277,531	1,790,134	443,937	357,295	70,698	731,346	.....	82,088	1,685,364	104,769	97,171	7,577	—290,773
Kansas City Southern	837	5,273,902	1,005,304	6,916,879	780,120	777,254	223,294	2,184,693	.....	276,071	4,162,380	2,754,499	368,485	2,383,193	337,726
Lake Erie & Western	900	3,819,318	509,727	4,556,762	510,260	837,187	100,020	1,522,612	.....	100,353	3,070,433	1,486,329	186,803	1,298,945	617,757
Lehigh & Hudson River	97	1,208,949	69,740	1,400,908	144,858	182,129	12,032	450,250	.....	33,723	822,992	577,916	36,800	541,116	206,505
Lehigh & New England	296	2,193,821	9,726	2,322,323	297,106	247,744	14,667	560,356	.....	45,008	1,164,464	1,157,859	53,080	1,104,776	433,891
Lehigh Valley	1,442	26,488,453	2,881,436	31,254,043	3,393,629	6,270,201	661,953	11,033,278	100,182	584,770	22,021,328	9,232,716	1,141,500	8,089,428	1,420,971
Long Island	397	2,665,038	5,476,502	9,369,382	1,029,729	1,001,356	91,369	3,768,353	48,690	251,973	6,188,563	3,180,819	612,588	2,563,584	287,689
Louisiana & Arkansas	279	925,547	124,730	1,083,434	198,310	180,631	26,001	281,875	.....	32,884	719,702	363,731	60,840	302,682	—8,288
Louisiana Ry. & Navigation Co.	351	1,198,391	232,561	1,524,573	221,644	220,342	50,038	496,409	.....	40,201	1,028,634	495,939	76,000	419,803	183,322
Louisiana Western	208	1,078,446	431,236	1,614,951	207,706	260,717	56,511	431,241	14,937	48,648	1,019,643	595,307	75,089	519,731	133,519
Louisville & Nashville	5,038	29,013,327	7,562,859	39,304,101	5,523,352	7,042,318	980,314	11,560,219	191,234	840,897	26,037,820	13,266,280	1,532,593	11,718,445	4,954,570
Louisville, Henderson & St. Louis	200	718,408	278,460	1,054,024	242,342	137,648	41,098	318,829	.....	25,423	765,340	288,684	30,400	258,080	55,332
Maine Central	1,220	4,966,201	2,301,755	7,847,491	1,094,801	1,109,553	89,022	2,853,531	34,083	230,233	5,410,168	2,437,323	419,561	2,017,450	323,173
Michigan Central	1,803	16,814,374	6,700,911	26,604,853	3,103,088	4,050,040	492,447	9,257,338	414,843	509,064	17,826,820	8,778,033	1,073,936	7,699,667	3,168,729
Midland Valley	380	871,738	272,399	1,207,576	217,599	178,325	18,949	391,267	.....	47,917	854,058	353,518	51,637	301,420	109,633
Minneapolis & St. Louis	1,646	5,545,955	1,323,387	7,278,447	763,913	991,861	140,675	2,628,248	657	178,284	4,703,638	2,574,809	293,529	2,278,818	396,275
Minn., St. Paul & Sault Ste. Marie	4,229	17,473,084	4,414,014	23,589,946	2,148,688	2,730,672	425,216	6,826,028	131,376	465,891	12,706,448	10,883,498	1,066,485	9,817,003	3,260,621
Missouri & North Arkansas	365	503,084	230,595	789,338	223,406	173,331	23,120	284,998	.....	42,260	748,116	41,223	46,354	—5,731	119,771
Missouri, Kansas & Texas System	3,865	14,582,370	5,660,108	21,819,521	4,391,615	3,538,121	457,103	7,464,635	129,007	728,301	16,665,346	5,154,175	1,126,572	4,022,496	—2,377,606
Missouri, Oklahoma & Gulf	334	732,177	160,757	929,325	273,882	190,887	33,994	408,902	899	60,117	964,649	—35,325	47,347	—83,299	83,345
Missouri, Oklahoma & Gulf of Texas	125	138,727	3,174	143,611	25,337	17,732	13,924	73,878	.....	10,488	141,359	2,252	1,403	849	—16,766
Missouri Pacific	3,931	15,637,128	3,461,644	20,848,131	3,108,969	4,318,137	506,959	7,449,526	76,386	523,422	15,974,083	4,874,047	818,001	4,033,969	47,299
Mobile & Ohio	1,122	6,432,541	823,474	7,680,059	800,179	1,658,753	289,004	2,699,561	18,803	248,402	5,690,774	1,989,285	257,531	1,730,049	111,307

‡ Figures shown here are for three months ended February 29, 1916.

REVENUES AND EXPENSES OF RAILWAYS

EIGHT MONTHS OF FISCAL YEAR 1916—CONTINUED

Name of road.	Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total (inc. misc.)	Operating expenses: Maintenance of Way and structures.	Maintenance of Equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.	Net from railway operation.	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Monongahela	108	$1,139,328	$40,009	$1,197,746	$146,364	$101,081	$6,757	$252,734	.....	$25,793	$532,729	$665,017	$42,855	$622,162	.....
Morgan's La. & Texas R. R. & S. S. Co.	405	2,091,290	654,892	3,011,035	465,207	520,481	93,861	1,078,462	$18,529	92,799	2,268,441	742,594	175,530	565,869	—$9,060
Nashville, Chattanooga & St. Louis	1,231	5,879,987	1,803,472	8,350,261	891,538	1,550,475	397,513	2,948,036	82,496	283,507	6,152,176	2,198,084	209,000	1,986,820	986,232
Nevada Northern	165	1,060,545	86,480	1,180,226	140,260	108,425	5,235	223,330	590	37,526	515,365	664,861	56,294	608,548	415,131
New Orleans & North Eastern	204	1,847,034	388,040	2,494,067	274,682	450,941	83,295	766,843	46,391	91,393	1,713,411	780,656	119,198	661,457	234,769
New Orleans, Mobile & Chicago	402	1,050,957	192,833	1,306,191	195,650	216,546	34,675	401,100	—51	54,791	902,712	403,479	54,554	347,916	105,649
New Orleans Great Northern	285	847,668	212,381	1,176,974	150,884	184,749	20,722	333,387	1,390	49,404	740,537	436,437	27,225	408,886	72,275
New Orleans, Texas & Mexico	286	881,414	188,782	1,128,210	234,330	181,049	31,335	374,526	.....	77,769	899,008	229,202	12,030	216,637	76,233
New York Central Railroad	6,093	83,765,159	32,277,935	134,529,323	12,993,367	23,509,389	1,897,592	41,438,905	1,864,516	2,926,520	84,630,289	49,899,034	5,791,634	44,093,569	.....
New York, Chicago & St. Louis	570	8,020,248	929,017	9,305,012	685,988	1,558,146	361,741	3,624,274	30,276	172,281	6,432,707	2,872,305	333,440	2,533,393	1,295,413
New York, New Haven & Hartford	2,005	24,375,100	19,670,439	49,628,339	5,829,412	7,238,828	294,201	17,959,026	512,195	1,141,984	32,922,767	16,705,571	1,905,000	14,796,773	3,712,833
New York, Ontario & Western	568	4,091,504	1,209,716	6,154,742	764,132	963,703	60,092	2,287,625	.....	128,430	4,203,498	1,951,244	170,021	1,779,731	310,357
New York, Philadelphia & Norfolk	112	2,492,865	299,317	3,002,279	274,864	593,544	39,237	1,119,817	32,408	90,081	2,149,593	852,686	89,562	761,976	361,416
New York, Susquehanna & Western	140	1,692,348	408,918	2,348,190	175,282	246,304	15,061	1,056,160	.....	47,054	1,539,227	808,963	105,457	702,823	137,946
Norfolk & Western	2,049	32,137,123	3,929,845	37,289,301	4,312,641	6,630,986	450,082	9,274,876	69,204	575,100	21,131,155	16,158,146	1,365,000	14,790,550	6,746,043
Norfolk Southern	908	2,026,948	730,481	2,950,931	373,289	425,702	60,584	1,017,153	887	140,603	2,018,219	932,712	99,316	830,461	317,594
Northern Pacific	6,510	36,154,858	9,369,831	49,820,867	5,377,471	4,783,817	754,299	13,729,991	664,934	744,159	25,676,097	24,144,770	3,071,762	21,069,661	6,095,472
Northwestern Pacific	507	1,144,652	1,404,266	2,859,660	462,482	323,274	41,570	965,751	653	63,165	1,842,663	1,016,997	137,029	879,643	346,408
Oahu Railway & Land Co.	114	629,216	169,904	854,476	82,045	66,729	5,464	190,374	.....	43,378	387,990	466,487	68,111	398,375	—21,943
Oregon Short Line	2,259	12,299,563	3,188,887	16,710,868	1,986,428	1,951,498	285,210	3,727,377	247,430	433,611	8,627,791	8,083,078	1,085,835	6,993,605	1,992,272
Oregon-Washington R. R. & Nav. Co.	2,055	7,415,549	2,989,300	11,364,907	1,781,019	1,282,445	364,853	3,570,549	127,702	475,644	7,573,340	3,791,567	816,125	2,974,162	—87,429
Panhandle & Santa Fe	670	2,707,677	672,124	3,535,235	633,768	528,176	33,045	832,515	.....	84,510	2,108,533	1,426,702	98,895	1,327,120	666,686
Pennsylvania Company	1,758	34,262,249	7,294,602	45,777,294	5,738,458	7,391,864	613,905	14,552,961	255,371	1,003,645	29,554,571	16,222,723	2,247,651	13,972,822	7,732,427
Pennsylvania Railroad	4,541	103,384,218	27,457,964	143,204,096	17,760,211	27,044,322	1,538,015	49,128,909	1,846,331	3,411,638	100,729,425	42,474,671	5,121,779	37,316,147	14,734,417
Pere Marquette	2,248	9,759,428	2,840,918	13,877,418	1,205,372	2,725,939	242,438	4,786,759	32,578	332,873	9,322,209	4,555,209	431,607	4,117,062	1,145,422
Philadelphia & Reading	1,120	31,271,593	4,491,674	37,537,533	2,643,079	5,961,606	381,280	12,349,766	102,384	611,282	22,036,588	15,500,944	802,412	14,693,933	5,613,288
Philadelphia, Baltimore & Washington	717	7,838,801	5,943,519	15,194,463	2,092,168	2,705,382	205,643	5,802,819	758	400,995	11,207,764	3,986,698	436,252	3,547,801	1,600,636
Pittsburgh & Lake Erie	225	12,723,893	1,173,496	14,725,317	1,086,731	2,020,638	108,399	3,061,249	27,010	229,025	6,533,053	8,192,265	414,322	7,777,899	5,164,337
Pittsburgh, Cincinnati, Chic. & St. Louis	1,489	21,448,756	5,884,687	30,736,896	4,278,372	5,553,067	515,251	10,292,291	209,420	716,667	21,564,911	9,171,985	1,322,389	7,847,590	2,917,334
Pittsburgh, Shawmut & Northern	294	1,536,904	75,209	1,633,993	232,261	389,443	12,796	481,081	.....	38,374	1,153,955	480,038	14,986	465,053	251,981
Port Reading	21	1,086,224	.....	1,235,204	68,189	96,139	307	485,987	.....	1,516	652,131	583,073	80,000	503,073	109,184
Richmond, Fredericksburg & Potomac	88	1,032,824	701,476	2,004,175	144,025	235,369	28,280	676,447	25,067	59,548	1,168,737	835,438	66,111	769,081	239,427
Rutland	468	1,339,028	822,883	2,471,982	303,500	406,627	72,780	859,127	8,403	47,074	1,697,510	774,472	135,863	638,600	186,737
St. Joseph & Grand Island	258	908,729	212,221	1,191,134	231,849	175,766	34,991	398,278	.....	45,644	886,527	304,607	65,594	238,698	48,199
St. Louis, San Francisco & Texas	244	502,721	186,577	763,042	173,004	125,790	16,076	337,973	.....	35,667	688,509	74,532	14,604	59,761	8,163
St. Louis, Brownsville & Mexico	548	1,098,980	510,653	1,746,638	317,053	241,481	43,074	556,615	.....	81,136	1,215,569	531,069	71,389	457,840	141,519
St. Louis, Iron Mountain & Southern	3,361	16,200,224	3,831,301	21,636,782	3,456,481	4,268,452	487,161	6,153,601	63,347	489,747	14,897,247	6,739,536	895,782	5,818,622	379,810
St. Louis Merchant's Bridge Terminal	9	.....	1,868	1,485,725	188,151	66,686	6,307	662,268	.....	52,456	977,867	507,858	73,175	434,672	156,832
St. Louis & San Francisco	4,750	20,867,878	7,374,113	30,175,882	4,515,429	4,705,312	524,480	9,610,972	.....	738,943	19,879,744	10,296,078	1,389,248	8,893,284	1,180,290
St. Louis Southwestern	943	4,059,153	906,202	5,290,743	408,868	820,735	227,510	1,298,777	26,380	202,404	2,981,280	2,309,462	239,376	2,068,285	777,319
St. Louis Southwestern of Texas	811	2,046,367	640,554	2,904,551	458,885	642,700	107,143	1,192,997	6,808	144,365	2,489,228	415,323	143,658	270,966	486,043
San Antonio & Aransas Pass	724	1,946,204	678,644	2,812,518	531,854	445,774	53,297	1,181,566	.....	97,918	2,309,212	503,306	141,104	361,897	205,207
San Pedro, Los Angeles & Salt Lake	1,154	4,294,204	2,122,592	7,119,594	672,667	1,063,487	258,145	2,090,575	184,347	141,397	4,388,760	2,730,834	390,736	2,339,451	765,937
† Seaboard	3,449	4,545,177	1,497,142	6,712,637	747,852	905,381	213,288	2,208,054	43,883	192,696	4,311,154	2,401,483	293,777	2,105,499	.....
Southern Pacific	6,938	46,529,275	23,074,646	76,794,534	8,719,480	11,088,054	1,475,344	23,313,025	1,455,886	1,844,823	47,764,810	29,029,723	3,337,653	25,682,060	5,392,860
Southern	7,022	30,367,666	11,165,971	45,591,977	5,463,627	7,208,920	1,265,663	15,092,053	250,731	1,351,942	30,326,554	15,265,423	1,896,481	13,351,290	4,981,621
Spokane, Portland & Seattle	555	2,003,284	1,008,732	3,344,281	322,145	282,864	64,609	762,071	29,240	104,592	1,562,007	1,782,274	427,200	1,354,282	254,088
Staten Island Rapid Transit Co.	11	374,366	206,896	818,277	81,778	45,677	5,826	333,204	.....	20,394	486,879	331,398	40,500	290,895	—17,345
Tennessee Central	294	735,714	254,938	1,054,548	219,848	144,173	45,674	394,628	.....	52,409	856,654	197,894	37,703	159,675	73,189
Terminal R. R. Ass'n of St. Louis	37	.....	1,921	2,017,902	218,143	117,221	7,196	659,505	.....	38,954	1,041,019	976,883	215,287	761,587	104,187
Texas & New Orleans	468	1,966,194	715,362	2,968,445	461,523	620,367	64,581	1,027,304	78,333	80,459	2,331,945	636,499	162,935	471,818	386,610
Texas & Pacific	1,944	9,238,843	2,922,753	13,133,361	1,456,701	1,971,666	303,295	4,988,340	109,995	379,774	9,196,657	3,936,704	639,038	3,294,960	432,659
Toledo & Ohio Central	436	2,912,938	405,547	3,530,953	432,221	717,188	55,579	1,229,727	14,339	78,244	2,527,299	1,003,654	192,686	810,362	121,876
Toledo, Peoria & Western	248	468,028	308,635	829,357	126,359	233,089	17,718	305,352	.....	29,534	712,052	117,305	48,000	69,305	43,569
Toledo, St. Louis & Western	451	3,227,897	254,208	3,703,523	447,289	548,471	130,618	1,224,579	.....	67,652	2,417,753	1,285,770	142,342	1,143,428	500,318
Ulster & Delaware	129	351,469	225,606	705,307	82,741	78,126	10,470	283,698	482	24,302	479,818	225,488	28,000	197,055	137,662
Union Pacific	3,619	29,996,181	7,367,499	41,360,650	4,988,243	5,169,169	900,916	9,834,672	666,280	957,866	22,495,479	18,865,170	1,660,531	17,198,353	3,215,778
Union R. R. of Baltimore	8	932,337	175,970	1,122,662	133,453	.....	.....	37,785	.....	17,244	188,482	934,180	41,768	892,413	18,605
Union R. R. of Pennsylvania	31	.....	.....	3,641,381	272,697	751,042	845	1,298,661	.....	35,931	2,359,175	1,282,206	59,105	1,223,101	1,143,081
Vandalia	917	5,788,539	1,634,164	8,355,305	1,233,374	1,512,089	185,998	2,889,046	79,684	198,434	6,098,626	2,256,679	298,533	1,956,903	621,506
Vicksburg, Shreveport & Pacific	171	674,303	314,925	1,103,080	174,482	203,190	28,789	340,015	16,752	40,892	803,882	299,198	65,601	233,598	199,162
Virginia & Southwestern	225	1,148,881	113,619	1,302,242	196,900	289,030	17,313	353,820	.....	31,724	888,786	413,457	55,262	358,194	71,480
Virginian	505	4,172,815	295,222	4,755,915	502,946	813,330	42,858	945,485	98,075	123,410	2,511,229	2,244,586	178,500	2,065,996	644,066
Wabash	2,519	16,492,385	4,271,698	22,571,151	2,580,066	3,488,152	673,712	8,223,551	122,905	520,311	15,588,804	6,982,347	665,595	6,312,550	2,381,700
Washington Southern	36	347,753	397,532	978,876	111,733	110,998	11,119	317,578	11,065	25,860	588,352	390,223	30,021	360,189	186,109
West Jersey & Seashore	358	1,702,133	2,986,162	5,095,944	860,089	713,521	97,157	1,969,528	22,301	122,367	3,784,963	1,310,981	320,250	990,359	289,672
Western Maryland	689	6,126,088	643,321	7,099,162	841,936	1,117,655	171,847	2,314,733	47,577	160,174	4,648,981	2,450,181	222,000	2,228,181	1,067,506
Western Pacific	941	3,157,140	1,355,776	4,886,230	704,834	497,710	177,340	1,521,799	127,748	146,514	3,175,945	1,710,285	224,025	1,484,902	985,136
Western Ry. of Alabama	133	506,053	280,514	879,567	138,159	175,130	46,978	243,067	14,072	36,320	653,318	226,248	44,106	178,288	96,271
Wheeling & Lake Erie	512	4,933,362	420,405	5,778,799	731,848	908,473	66,155	1,712,801	13,658	116,250	3,549,185	2,220,615	285,925	1,943,683	1,326,260
Yazoo & Mississippi Valley	1,382	7,083,621	1,649,641	9,165,923	1,342,673	1,391,531	146,214	2,831,443	11,768	224,604	5,945,831	3,220,092	402,000	2,816,468	819,564

† Figures for three months ended February 29, 1916.

Strikes and Strike Threats

On Thursday, May 4, the day on which the telegraphers' brotherhood had been threatening to call out operators, signalmen and signal repairmen on the New York Central, G. W. W. Hanger, assistant commissioner of the Federal Board of Mediation and Conciliation called on the officers of the New York Central and of the brotherhood, at New York City, and offered his offices; and both sides soon accepted. Negotiations are understood to be now going on.

Newspaper reports of strikes of railroad employees during the past week have been literally too numerous to mention; but most or all of them appear to have been confined to a very limited territory. The strike of engineers on tugs in New York harbor, however, has continued to interfere seriously with the movement of freight. Several of the railroads came to terms with the strikers early last week, but railroad freight traffic is affected by strikes on boats connected with other interests, and the disturbance takes on a new aspect nearly every day. As we go to press, a strike of longshoremen is threatened in New York. On Monday of this week considerable delays were experienced in the fruit and produce trade in New York City by a strike of freight handlers on the New York piers of the Pennsylvania Railroad.

On Friday of last week there was a strike of shopmen on the Pittsburgh & Lake Erie. At Baltimore, Md., track repairmen of the Philadelphia, Baltimore & Washington struck for an eight-hour day at 25 cents an hour. Track repairmen of the Delaware & Hudson, north of Albany, struck on May 9. At Rochester, N. Y., the dwelling of a division engineer of the New York Central was damaged by a bomb, thought to have been placed by striking track repairers or their sympathizers.

Railway Signal Association

Secretary C. C. Rosenberg announces that the dates for the annual convention at Mackinac Island, Mich., will be September 12, 13 and 14, and headquarters will be at the Grand Hotel, which will be given up to the exclusive use of the signal men for the week beginning September 11. Reservations for rooms will be received by Mr. Rosenberg (Bethlehem, Pa.) after June 1. The official program will be issued about August 1. The hotel has 275 rooms, and the lowest rate for an ordinary room, American plan, is $4; for a single room with bath, $5.

MEETINGS AND CONVENTIONS

The following list gives names of secretaries, date of next or regular meetings, and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—F. A. Pontious, 455 Grand Central Station, Chicago. Next meeting, June 26, 1916, Boston, Mass.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, Illinois Central, East St. Louis, Ill. Next meeting, June 20-23, 1916, Cincinnati, O.

AMERICAN RAILROAD MASTER TINNERS', COPPERSMITHS' AND PIPEFITTERS' ASSOCIATION.—W. E. Jones, C. & N. W., 3814 Fulton St., Chicago. Next convention, May 22-24, 1916, Hotel Sherman, Chicago.

AMERICAN RAILWAY ASSOCIATION.—J. F. Fairbanks, general secretary, 75 Church St., New York. Next meeting, May 17, 1916, Biltmore Hotel, New York.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, 1112 Karpen Building, Chicago. Annual meeting, June 19, 1916, Atlantic City, N. J.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa. Annual meeting June 27 to 30, Hotel Traymore, Atlantic City, N. J.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesdays in month, except July and August, 220 W. 57th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—E. R. Woodson, Rooms 1116-8, Woodward Bldg., Washington, D. C. Annual meeting, June 28, 1916, Hotel Statler, Detroit, Mich.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS.—George W. Lyndon, 1214 McCormick Bldg., Chicago. Semi-annual meeting with Master Car Builders' Association. Annual convention, October, 1916, Chicago.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—Willis H. Failing, Terminal Station, Central of New Jersey, Jersey City, N. J. Next meeting, May 17, 1916, Hotel Traymore, Atlantic City, N. J.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W., Room 411, C. & N. W. Sta., Chicago. Semi-annual meeting, June 16, 1916, Hotel Denis, Atlantic City, N. J.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, Soo Line, 112 West Adams St., Chicago. Annual meeting, June 20-22, 1916, St. Paul, Minn.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York. Next meeting, June 27-28, Boston, Mass.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 Lawlor Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, Hotel La Salle, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September, and November. Annual meeting, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

CINCINNATI RAILWAY CLUB.—H. Boutet, Chief Interchange Inspector, Cin'ti Rys., 101 Carew Bldg., Cincinnati. Regular meetings, 2d Tuesday, February, May, September and November, Hotel Sinton, Cincinnati.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Traffic Manager, R. F. & P., Richmond, Va. Annual session, May 17, 1916, Washington, D. C.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month. Room 1856, Transportation Bldg., Chicago.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—J. G. Crawford, 547 W. Jackson Blvd., Chicago. Annual meeting, May 15-18, Hotel Sherman, Chicago.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Annual convention, May 23-26, 1916, Hollenden Hotel, Cleveland, Ohio.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, 1112 Karpen Building, Chicago. Annual meeting, June 14, 1916, Atlantic City, N. J.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meeting, 2d Tuesday in month, except June, July, August and September, Boston.

NEW YORK RAILROAD CLUB.—Harry D. Vought, 95 Liberty St., New York. Regular meeting, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

NIAGARA FRONTIER CAR MEN'S ASSOCIATION.—E. N. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria.

RAILROAD CLUB OF KANSAS CITY.—Claude Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Saturday in month, Kansas City.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Monongahela House, Pittsburgh.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Myers Bldg., Bethlehem, Pa. Semi-annual meeting, May 24-25, 1916, Hotel Astor, New York.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, N. Y. C. R. R., Box C, Collingwood, Ohio. Annual meeting, May 15-17, 1916, Hotel Statler, Detroit, Mich.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 2136 Oliver Bldg., Pittsburgh, Pa. Meetings with Master Car Builders' and Master Mechanics' Associations.

RAILWAY TELEGRAPH AND TELEPHONE APPLIANCE ASSOCIATION.—G. A. Nelson, 50 Church St., New York. Meetings with Association of Railway Telegraph Superintendents.

RICHMOND RAILROAD CLUB.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

SALT LAKE TRANSPORTATION CLUB.—R. E. Rowland, David Keith Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Piedmont Hotel, Atlanta.

TOLEDO TRANSPORTATION CLUB.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

TRAFFIC CLUB OF CHICAGO.—W. H. Wharton, La Salle Hotel, Chicago.

TRAFFIC CLUB OF NEWARK.—Roy S. Bushy, Firemen's Bldg., Newark, N. J. Regular meetings, 1st Monday in month, except July and August. The Washington, 559 Broad St., Newark.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month, except June, July and August, Waldorf-Astoria Hotel, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Gen't Agt., Erie R. R., 1924 Oliver Bldg., Pittsburgh, Pa. Meetings, bi-monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library Bldg., St. Louis, Mo. Annual meeting in November. Noonday meetings, October to May.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7122 Stewart Ave., Chicago. Next convention, June, 20, 1916, Toronto, Ont.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, Superintendent's Office, N. Y. C. R. R., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit.

UTAH SOCIETY OF ENGINEERS.—Frank W. Moore, 1111 Newhouse Bldg., Salt Lake City, Utah. Regular meetings, 3d Friday in month, except July and August, Salt Lake City.

WESTERN CANADA RAILWAY CLUB.—L. Kon, Immigration Agent, Grand Trunk Pacific, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, 1112 Karpen Bldg., Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Grand Pacific Hotel, Chicago.

WESTERN SOCIETY OF ENGINEERS.—E. N. Layfield, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August, generally on other Monday evenings. Annual meeting, 1st Wednesday after 1st Thursday in January, Chicago.

Traffic News

On Friday, May 5, the number of loaded freight cars moved by the Boston & Albany, eastward, across the Connecticut river, at Springfield, was 1,275, breaking all records.

The Erie & Western Transportation Company has contracted with the Stevens Engineering Company of Chicago to build grain storage bins at Erie, Pa., with a capacity of one million bushels.

The Chicago & North Western has announced that it will this month put on an additional train between Chicago and Denver in connection with the Union Pacific, leaving Chicago daily at 6:05 P. M.

On Tuesday of this week the Eastern Freight Accumulation Conference announced embargoes on all freight consigned to certain large individual concerns in New England, about 30 in all, who have inadequate unloading facilities.

Railroad passenger agents from Indiana, Illinois and Iowa will hold a meeting at Springfield, Ill., on May 11. There will be a banquet in the evening at the St. Nicholas hotel, at which addresses will be made by Governor Dunne of Illinois, and Adjutant General Frank S. Dickson.

The Georgia Railroad Commission has granted permission to the Ocilla Southern to convert some of its passenger trains into mixed trains, owing to the reduction of its income by automobile competition. The road is required by the order to render weekly reports of receipts and expenses.

Beginning on Sunday, May 14, a new freight service on reduced schedules will be established by the Nashville, Chattanooga & St. Louis, the Central of Georgia, and the Atlantic Coast Line from Chicago to Macon, Jacksonville and other Georgia and Florida points. The present schedule will be reduced nearly 24 hours.

J. H. Mercer, secretary of the Kansas Livestock Association, has issued a call for a convention of stock men to be held in Chicago on June 6, for the purpose of getting included in the Republican and Democratic national convention platforms a clause relating to certain changes in the freight rates on livestock desired by the association.

The New Orleans Texas & Mexico and its connections—the Gulf Coast Lines—have made a contract with the Illinois Central by which, beginning June 1, the passenger and freight terminals of the Illinois Central in New Orleans will be used by the Gulf Coast Lines. These lines discontinue their contract with the New Orleans Terminal Company mainly in order to secure more favorable arrangements for taking freight to and from the numerous industries in and around New Orleans, which are reached by the tracks of the Illinois Central.

Traffic Club of Pittsburgh

The fourteenth annual dinner of the Traffic Club of Pittsburgh was held at the William Penn hotel, Pittsburgh, on the evening of May 3, with an attendance of 800, besides 300 ladies who were served in the room adjoining the main banquet hall, and who were later given an opportunity to hear the speaking from the balcony. J. Fred Townsend, president of the club, presided as toastmaster, and addresses were made by J. T. Holdsworth, dean of the school of economics of the University of Pittsburgh, and by James E. Freeman, rector of St. Mark's church at Minneapolis.

RUMANIAN RAILWAYS.—Press despatches recently reported a railway agreement between Russia and Rumania, whereby the Rumanian railways will be transformed to the same gage as those of Russia. The correspondent says that the bridge over the Pruth between Jassy and Umgeni has already been altered to permit of the passage of Russian trains.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

The commission has appointed a further hearing on the matter of bills of lading, to be held at the Woolworth building, New York City, May 19, before Examiner Satterfield. The different parties, including those representing the carriers and also those representing the shippers, have requested an extension of time, and the order naming May 18 as the final date for hearing oral arguments has been canceled. September 15 has now been fixed as the date on or before which the briefs must be filed at Washington, and oral arguments will be heard there on the 20th of October. The informal conferences thus far held have resulted in agreement on a considerable part of the conditions to be printed in straight bills of ladings and in export bills; but the proposal to have a separate uniform bill for shipments of livestock has not made much progress.

Loading Export Grain at Philadelphia

Commercial Exchange of Philadelphia v. Pennsylvania Railroad et al. Opinion by the commission:

A charge of three-fourths cent per bushel at the port of Philadelphia for the loading of export grain from elevators directly into ocean-going vessels is not found to be discriminatory, as compared with the charge of one-half cent per bushel for like services at the port of New York. (38 I. C. C., 675.)

Danville, Va. Class and Commodity Rates

Opinion by Commissioner Harlan:

Proposed increased class rates between Danville, Va., and points in North Carolina are found justified.

When investigating the propriety of increased rates under suspension the commission, in addition to the question of their reasonableness, may consider to what extent they may involve unlawful discriminations and preferences in their relation to other rates; but to withhold approval of proposed rates that are found to be reasonable and in harmony with the general interstate rate adjustment in the territory in question solely because the state rates are on a lower level, would put both the carriers and the commission under the control of state authorities in many cases involving interstate rates. (38 I. C. C., 742.)

STATE COMMISSIONS

The Iowa Railroad Commission, under a resolution of the state legislature, has recently conducted an investigation of the practicability of converting the branch line of the Chicago, Milwaukee & St. Paul from Bellevue, Iowa, to Cascade, a distance of 36 miles, from narrow gage to standard gage, and has issued a report giving the railroad authority to continue the line as a narrow gage line. The company reported the earnings last year as $31,000, and the operating expenses $48,000. Clifford Thorne, chairman of the commission, dissented from the report, objecting to the method of figuring the earnings and expenses of the branch line.

Preliminary to the hearings which are to be held by the Georgia Railroad Commission on the revision of freight rates by railroads in that state, to bring the intrastate rates in line with the interstate rate changes made necessary by the fourth-section order of the Interstate Commerce Commission, the roads have been educating the public by means of a series of letters in the newspapers. There has been a large amount of discussion throughout the state on the rate question, and editorials are appearing in which the rates are criticized. The railroads are answering every point brought up by intelligent and responsible parties, issuing letters which have been given much prominence by the daily press in the larger cities. Letters have been printed six roads, the Atlanta, Birmingham & Atlantic, the Atlantic Coast Line, the Central of Georgia, the Georgia Southern & Florida, the Seaboard Air Line and the Southern

Railway. The railroad commission, in its annual report to the governor, directs attention to the fact that funds are lacking for the employment of additional help to deal with the rate cases.

COURT NEWS

Twenty-seven Illinois railroads have filed in the Circuit Court of Sangamon County an appeal from a recent decision of the Illinois Public Utilities Commission, reducing the rates to be charged shippers for cleaning and disinfecting stock cars.

Swift & Company, Chicago, was found guilty in the United States district court at Chicago on May 3 of violation of the interstate commerce laws on 29 counts, of an indictment charging the company with shipping less than carload shipments of meat products at carload rates to points in Michigan. It was testified that the goods were shipped to Owosso, Mich., in carloads, but were unloaded at various points en route. The company's attorneys stated that the practice was provided for in the railroad tariffs, but that the jurymen had been misled by their lack of knowledge of tariff technicalities.

Contract Limiting Liability—Measure of Damages

Under a contract for the carriage of cattle limiting the carrier's liability to the valuation declared by the shipper, the rate charged being based on such valuation, the Kansas City Court of Appeals holds that the liability was not based on such valuation, but only limited to such valuation, and the measure of damages was the amount of actual damages from the carrier's negligence, in no case to exceed the sum stipulated.—Greening v. C. & N. W. (Mo.), 183 S. W., 1,121.

"Accident" Within Workmen's Compensation Act

A track-repair laborer, while mowing grass on a right of way, came in contact with poison ivy, resulting in his sickness. While in bed, owing to his reduced power of resistance to disease, he contracted bronchitis, of which he died. The New York Appellate Division, in a proceeding under the Workmen's Compensation Act, held that his death was accidental, within the meaning of the act, and not the result of an occupational disease, and that compensation could be properly awarded.—Plass v. Central New England, 155 N. Y. Supp., 854.

Taxation—Interest and Penalties

Under a Kentucky taxation statute an assessment may be appealed, within 30 days after the final adjournment of the county board of assessors, to the quarterly court. A railroad appealed promptly from its assessment for five successive years. At the end of that time all the appeals were decided together, granting a reduction of several million dollars from the assessments. It paid the tax promptly after the decision of the appeals. The Kentucky Court of Appeals holds that it is not liable for interest and penalties accruing prior to the determination of the appeals. It would have been only a reckless guess to have undertaken to approximately fix the amount of its taxes for any one year involved, so as to have tendered it before the interest and penalty attached.—Commonwealth v. Southern Pacific (Ky.), 183 S. W., 925.

Fellow Servants

A member of a section crew, riding on a hand car in charge of the foreman, who permitted it to run at high speed, was injured by the foreman's negligence in suddenly applying the brake. The Tennessee Supreme Court holds that the railroad was not liable, since, in taking part in the active operation of the hand car, the foreman became a fellow servant of the injured employee. The foreman was not specially required to use the brake; any of the men on the car might have used it. If he had been directed to handle the brake himself the case would have been different. Handling the brake was merely an incident to the operation of the car—the act of a servant. The railroad, having provided a safe roadbed, a hand car in good condition, and having exercised due care in the selection of servants to operate it, was not liable for the negligence of one of its servants in such operation.—Allen v. Chamberlain (Tenn.), 183 S. W., 1,034.

Duty to Assist Certain Passengers from Trains

The Texas Court of Civil Appeals says that no Texas decision has ever held that it was the duty, as a matter of law, for railroads to assist passengers from their trains, nor has it ever been held in any case that circumstances could not arise in which it becomes their duty to do so. In an action for injuries received by a passenger who fell from the top step to the platform, the issue, as stated by the court, was: Did the railroad owe the duty to a female passenger, 59 years of age, who was quite corpulent, weighing 175 to 180 pounds, having two bundles and a handbag, and having under her charge a five-year-old boy, to assist her to alight from its train? It was held this was a question of fact for the jury, and that they were justified in finding the railroad was negligent.—International & G. N. (Tex.), 183 S. W., 1,185.

Train Damaging Automobile—Repairing and Holding for Owner

In an action for damages for conversion of the plaintiff's automobile, it appeared that the car was struck on a highway crossing by the defendant's train. The plaintiff left the machine on the right of way for several days, refusing to remove it. Thereafter the company's claim agent consulted the plaintiff's attorney as to the disposal of the car, suggesting that the company be allowed to take it to another town for repair, and was advised that he would have to "back his own judgment." The car was taken and repaired as suggested, and was afterwards held for the owner's instructions, with notice to the owner. The company held the automobile in storage for some time, while futile negotiations for settlement took place, which ended with the bringing of the action for conversion. The Texas Court of Civil Appeals holds that, since the company did not attempt to exercise any right of ownership over the car, and did not take it without the owner's consent, it was not guilty of conversion. There was some evidence that while the car was held in storage, some persons unauthorized by the company took it out and slightly damaged it; whereupon the company repaired the damage and locked the car up in a roundhouse. It was held that this was not such an illegal use or abuse of the automobile as constituted a conversion by the defendant.—Gulf, Colorado & Santa Fe v. Pratt (Tex.), 183 S. W., 103.

Injury from Loose Door—Negligence Must be Proved

In an action to recover for being struck by a loose freight car door while walking along a station platform, the Missouri Supreme Court holds that proof that the door was loose and swinging, and that it struck the plaintiff and caused his injury, was not alone sufficient to support a verdict for the plaintiff. It was further necessary for the plaintiff to establish that the defendant was negligent in failing properly to inspect the train, or to show that it had actual or constructive knowledge of the condition of the door a sufficient length of time before the accident to have been enabled, in the exercise of ordinary care, to repair it, the defendant did not occupy the position of insurer towards the plaintiff. It appeared that the defendant had inspected the train at three different points on the road (the last only 20 miles from the scene of the accident) without detecting the loose door. It was therefore held that the running of the train, with the door hanging loose, past the station was not negligence per se. Judgment for the plaintiff was reversed.—Thompson v. St. Louis Southwestern (Mo.), 183 S. W., 631. This is the second time judgment for the plaintiff has been reversed in this case. In the former trial (243 Mo. 355, 147 S. W., 484) the reason for the reversal was that the trial court instructed that the maxim res ipsa loquitur applied, although the defendant had produced evidence tending to show a proper inspection of the car.

Liability for Special Officer's Actions

A special officer employed in railroad yards was authorized to watch the yards, to see that no suspicious characters were loafing around in them, to find out every seemingly suspicious person's business, and put out such as had no business in the yards, to examine cars to see whether the seals were broken, and to keep people having nothing to do with the company off the property. He found certain car seals broken, and forcibly ejected from the yards persons whom he suspected of having broken them, and who then made threats against him. On the

following night he was suddenly seized by two men whom he believed to be the men ejected from the yards, and, as stated by him, became rattled, and lost his head, and shot them without warning. In an action against the railroad for the death of one of them the trial court directed a verdict for the defendant. On appeal, the Michigan Supreme Court held that the test of the railroad's liability was: Did the special officer at the time have in mind the furtherance of his master's business? If he did, then the railroad was liable. If he did not, but had in mind only his own self-preservation, as claimed by the officer and the railroad, then the railroad was not liable. The court thought the question was one for the jury, as the testimony was such that they might have found either way, and a new trial was ordered.—Cook v. Michigan Central (Mich.), 155 N. W., 541.

Guarding Cattle in Station Yard

An owner of cattle started to drive them about 12 miles to a station to ship them. On the way he telephoned the station agent to see if there was a car to load them in. He was told there was no car, but that he could get one next morning. In reply to his inquiry as to what he should do with the cattle overnight, the agent said: "We can put them in the yard." The owner of the cattle drove them to the station, and, without informing the agent, and without feeding them, put them in the station yard, which was properly fenced, but he did not put up all the gate bars, and left no one to guard the cattle. The cattle broke through the gate in search of food, and some were killed by a train. In an action for their loss, the Maine Supreme Court held that, the plaintiff being a mere invitee, the railroad was under no obligation to guard the cattle, and was guilty of no negligence.—Smith v. Maine Central (Me.), 96 Atl., 778.

Validity of Special Contract for Term of Years

A Pennsylvania intrastate contract was made in 1901 between a railroad and a steel company for a period of 30 years to transport coal from the mines in the Pittsburgh district to Monaca at 50 cents a ton, the then existing rate. The railroad subsequently raised its published rates to 60 cents, and for some time the steel company paid this rate, but afterwards refused, and in an action by the railroad counterclaimed for the excess paid, if it should be found that its contract with the railroad was valid. The Pennsylvania Supreme Court, following Hoover v. Pennsylvania, 156 Pa. 220, 27 Atl. 282, decided nine years before, held that a special contract for a special rate with a manufactory for the transportation of fuel, like that in question, is not undue or unreasonable discrimination in violation of the State Constitution, or of the act of June 4, 1883, which prohibit undue and unreasonable discrimination in transportation charges, notwithstanding the railroad's revision of its published rates.—Pittsburgh & Lake Erie v. Colonial Steel Co. (Pa.), 96 Atl., 1037.

Conductors as Peace Officers—Protection of Passengers from Intoxicated Persons

An Arkansas statute constitutes all conductors peace officers on their respective trains to arrest any person found drunk, and charges them with the duty of delivering such drunken person to the nearest peace officer, with the names of two witnesses who are not railroad employees. The Arkansas Supreme Court, in an action for injuries to a female passenger from an assault and insults by a drunken fellow-passenger, holds that it is the duty of a railroad, under this statute, to arrest any person found in an intoxicated condition on its trains, to use reasonable care to prevent intoxicated persons from boarding its trains, and if its servants knew, or by reasonable care should have known, that a person was drunk and liable to insult or annoy passengers, not to permit him to board the train; and, if they became aware of his condition after he became a passenger, to exercise reasonable care to prevent him from annoying other passengers. An allowance of $250 damages to a female passenger whose arm was seized by a drunken fellow passenger, who returned, after he had been removed, to renew his insults, was held not excessive, the jury being held warranted in finding that the trainmen knew, or should have known, that the passenger was drunk, and, if not arrested, would require special observation.—Memphis, Dallas & Gulf (Ark.), 183 S. W., 981.

Railway Officers

Executive, Financial, Legal and Accounting

Henry McAllister, Jr., assistant general counsel of the Denver & Rio Grande, has been promoted to general counsel, to succeed the late Joel F. Vaile.

W. E. Summerskill, assistant to the general auditor of the St. Louis & San Francisco, has been appointed auditor of the Paris & Great Northern, with office at Paris, Texas, vice J. N. Bailey, deceased.

Charles H. Nowell, paymaster of the Boston & Maine and subsidiary lines, has been appointed assistant treasurer of the St. Johnsbury & Lake Champlain, the Montpelier & Wells River and the Barre & Chelsea, succeeding Herbert E. Fisher, who has retired on account of ill health. Henry M. Piper has been appointed paymaster of all of the above roads, succeeding Mr. Nowell. Both with headquarters at Boston, Mass.

William Cotter, formerly president and general manager of the Pere Marquette, has been elected president and general manager of the Manufacturers' Railway and the St. Louis & O'Fallon Railway of St. Louis, Mo., vice G. F. Moore, resigned on account of ill-health. Mr. Cotter was born in 1858 at Bloomington, Ill. He entered railway service as a telegraph operator on the Chicago & Alton in 1874. From 1878 to 1880 he was telegraph operator on the St. Louis, Iron Mountain & Southern at Piedmont, Mo.; from 1880 to 1882 he was train despatcher and trainmaster of the same railroad at Little Rock, Ark. From 1882 to 1883 he was despatcher of the Chicago, Milwaukee & St. Paul at La Crosse, Wis. He was appointed train despatcher of the Wabash, St. Louis & Pacific, later the Wabash Railroad, with headquarters at Litchfield, Ill., in 1883; in 1890 he was made trainmaster of the St. Louis division of the same railroad, and in 1896 was appointed superintendent of the Eastern division of the Grand Trunk, with office at Montreal, Que. From 1899 to July 1, 1901, he was superintendent of the Western division of the same railroad, with office at Detroit, Mich. In 1901 and 1902 he was stationed at St. Louis, Mo., as general superintendent of the St. Louis, Iron Mountain & Southern. From October, 1902, to October 1, 1904, he was manager of the Missouri Pacific Railway System, and from the latter date until January 1, 1913, was general manager of the Pere Marquette. From December 14, 1907, to April 5, 1912, when the Pere Marquette was placed in the hands of receivers, he was also president of that road.

W. Cotter

Operating

F. G. Minnick, car accountant of the Pittsburgh & Lake Erie at Pittsburgh, Pa., has been appointed superintendent car service, with office at Pittsburgh.

T. G. Grimwood has been appointed chief despatcher of the Evansville & Indianapolis, with headquarters at Terre Haute, Ind., vice C. G. Gepner, resigned.

Taber Hamilton, master mechanic of the Cumberland Valley at Chambersburg, Pa., has been appointed superintendent of the Peoria division of the Vandalia Railroad at Decatur, Ill.

J. F. Patterson, division superintendent of the Vandalia at Decatur, Ill., has been appointed superintendent of the Michigan

division, with office at Logansport, Ind., vice F. L. Campbell, deceased.

P. B. Torian has been appointed superintendent of terminals of Morgan's Louisiana & Texas Railroad and Steamship Company, with headquarters at New Orleans, La., vice J. K. Fahey, resigned to accept service with another company.

A. E. Stevens, general superintendent of the eastern division of the Canadian Pacific, with office at Montreal, Quebec, has been appointed general superintendent of the Saskatchewan division, vice J. G. Taylor, granted leave of absence on account of ill-health.

G. H. Jacobus has been appointed assistant to the general superintendent of the Central district of the Northern Pacific, with headquarters at Livingston, Mont. O. F. Ohlson has been appointed assistant to the general superintendent of the Eastern district, with headquarters at St. Paul, Minn., effective May 5.

F. W. Kelsey, whose appointment as superintendent of the Chattanooga division of the Nashville, Chattanooga & St. Louis, with headquarters at Nashville, Tenn., has already been announced in these columns, was born on January 5, 1876, at Lynnville, Giles county, Tenn., and began railway work in August, 1895, as operator and agent on the Louisville & Nashville. In October, 1898, he became clerk in the trainmaster's office at Nashville, Tenn. From April, 1900, to May, 1906, he was train despatcher on the Nashville division, and then became assistant trainmaster on the same division, remaining in that position until October, 1911. He then served as trainmaster at Columbia, Tenn., in charge of the Nashville, Florence & Sheffield division of the same road. On April 8, 1916, he entered the service of the Nashville, Chattanooga & St. Louis, as assistant superintendent of the Chattanooga division, and on April 20 was appointed superintendent of the same division, as above noted.

F. W. Kelsey

Herman J. Klein, trainmaster of the Erie at Meadville, Pa., has been appointed assistant superintendent of the Mahoning division, with headquarters at Youngstown, Ohio. Edwin H. Buhlman, trainmaster of the Marion division at Huntington, Ind., has been appointed trainmaster at Meadville, Pa., vice Mr. Klein. Carl W. Bucholtz, division engineer on the Meadville division, has been appointed trainmaster of the Marion division, vice Mr. Buhlman.

Allan Purvis, superintendent of the Canadian Pacific at London, Ont., has been promoted to general superintendent of the Eastern division, with headquarters at Montreal, Que., succeeding A. E. Stevens, transferred. Thomas Collins, superintendent of District No. 4 at Toronto, Ont., has been appointed superintendent of District No. 2, with headquarters at London, vice Mr. Purvis, and W. Tansley, assistant superintendent at Montreal, Que., has been appointed assistant superintendent of District No. 2, with office at London, vice D. Carmichael, transferred.

Jonathan M. Jones, recently appointed assistant superintendent of the Philadelphia Terminal division of the Pennsylvania Railroad, with headquarters at Philadelphia, Pa., was born on May 4, 1866, at Milwaukee, Wis., and entered the service of the Pennsylvania Railroad in July, 1883, as a telegraph operator at Grays Ferry on the Maryland division. Five years later he was transferred to the Philadelphia division as telegraph operator in the superintendent's office. In 1892 he was appointed train director at Seventeenth street tower, and in 1896 was appointed assistant yardmaster at Philadelphia. On April 1, 1903, he was promoted to yardmaster, and in March of the following year was appointed passenger trainmaster of the Philadelphia Terminal division, which position he held at the time of his recent appointment as assistant superintendent of the same road, as above noted.

Traffic

H. E. Williams, traveling freight agent of the Southern Railway, Macon, Ga., has been appointed commercial agent, with office at Athens, Ga., vice Paul Pinkerton, resigned to engage in other business.

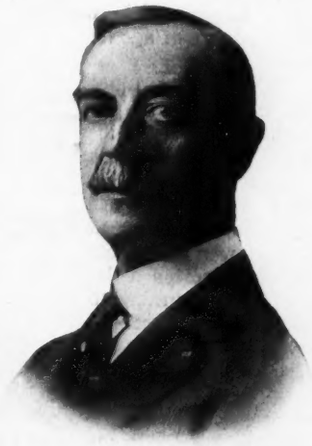
B. E. Nichols, commercial agent of the Illinois Central at Sioux City, Iowa, has retired under the pension rules of the company after more than 45 years of service. Fred. Austin, city passenger and ticket agent at Waterloo, Iowa, has been appointed commercial agent at Sioux City, to succeed B. E. Nichols.

W. H. Wynne, commercial agent of the Southern Pacific Lines at Little Rock, Ark., has been transferred to New Orleans, La., vice A. M. Post, resigned. L. C. Bouchard, traveling freight and passenger agent at New Iberia, La., has been appointed commercial agent with office at Little Rock, succeeding Mr. Wynne.

R. V. Miller, traveling freight agent of the Wabash, at Kansas City, Mo., has been promoted to commercial agent at Tulsa, Okla. He will have charge of traffic to or from points in the state of Oklahoma, and will report to R. W. Owens, assistant general freight agent, Kansas City, Mo. The Tulsa agency is a new one.

A. L. P. Green, traveling freight agent of the Norfolk & Western at Nashville, Tenn., has been appointed commercial agent, with office at Little Rock, Ark., vice H. C. Montgomery, resigned on account of ill health. C. W. Robinson has been appointed commercial agent at Minneapolis, Minn., vice Frank Fairfield, resigned.

Daniel S. Spencer, recently appointed general passenger agent of the Oregon Short Line, succeeding David E. Burley, resigned, was born at Salt Lake City, Utah, on June 12, 1857. He was educated in the common schools and at Utah University. In 1874 he entered railway service as office boy on the Utah Central and the Utah Southern. He has been continuously in the service of these roads and the Oregon Short Line, which later absorbed them, up to the present time. He has held the following positions in succession: Telegraph operator, station agent, ticket agent at Salt Lake City, train despatcher, chief clerk to the general agent passenger department, Salt Lake City; chief clerk general passenger and ticket office of the Oregon Short Line, and assistant general passenger and ticket agent, with office at Salt Lake City. As general passenger agent he will continue to have headquarters at Salt Lake City.



Daniel S. Spencer.

H. C. Dinkins, foreign freight agent of the International & Great Northern at Houston, Texas, has been appointed general agent, traffic department, with headquarters at Kansas City, Mo. The office of foreign freight agent has been abolished and its duties have been divided between J. M. Ball, assistant general freight agent, Houston, Texas, and L. M. Hogsett, general freight agent, Houston, Texas.

C. R. Davidson, chief clerk to passenger traffic manager, has been appointed assistant general passenger agent of the Chicago & Alton; C. W. Galligan, now general freight agent, has been appointed assistant freight traffic manager; A. E. Lee, assistant general freight agent, has been appointed general freight agent, succeeding Mr. Galligan, and J. F. Vosburgh has been appointed assistant general freight and passenger agent. All with headquarters at Chicago.

J. K. Butler, assistant general freight agent of the Southern Pacific at San Francisco, Cal., has resigned, and on June 14 will leave for Honolulu, H. I., where he will become traffic manager of the Oahu Railway & Land Company. This railroad handles the bulk of the sugar and pineapple shipments of the Hawaiian Islands. Mr. Butler entered the service of the Southern Pacific 13 years ago as statistical clerk in the freight department. In 1909 he was placed in charge of a special bureau of the freight department to handle cases before the Interstate Commerce Commission and the state railroad commission, and his further advancement followed his work as an expert railroad witness in the Intermountain rate case.

David E. Burley, general passenger agent of the Oregon Short Line at Salt Lake City, Utah, retired from active service on May 1. Mr. Burley was born at Amanda, Ohio, on March 8, 1849. He was educated in the public schools and at Asbury University, now De Pauw University, at Greencastle, Ind. He entered railway service as traveling passenger agent of the Union Pacific at Baltimore, Md., in 1879. From July 1, 1889, to July 1, 1891, he was traveling passenger agent of the same railroad at Philadelphia, Pa. On the latter date he was promoted to general agent of the passenger department of the same road with office at Salt Lake City, Utah, and on March 17, 1897, was appointed general passenger and ticket agent of the Oregon Short Line, the position he held up to the time of his retirement on May 1 of this year.

Engineering and Rolling Stock

John R. Sexton has been appointed division engineer of the Meadville division of the Erie with office at Meadville, Pa., vice C. W. Bucholtz, promoted.

Frank Strong has been appointed division engineer maintenance of way, of the Salt Lake division of the San Pedro, Los Angeles & Salt Lake, with office at Salt Lake City, Utah, to succeed R. K. Brown, promoted.

R. K. Brown, recently appointed engineer maintenance of way of the San Pedro, Los Angeles & Salt Lake, with headquarters at Los Angeles, Cal., was born in Cincinnati, Ohio, in 1876. When 16 years of age he entered the employ of the Pennsylvania Lines West of Pittsburgh, as a rodman. During intervals between periods of employment he attended the Rensselaer Polytechnic Institute, at Troy, New York, from which he received a degree. After returning to the Pennsylvania Lines he was advanced to the office of division engineer, with headquarters at Richmond, Ind. In 1902 he left the Pennsylvania Lines and went to Los Angeles, Cal., to become division engineer of the San Pedro, Los Angeles & Salt Lake. In the following year when the Salt Lake route acquired a line into Salt Lake City, Utah, he was transferred to the latter city as division engineer, maintenance of way, of the Salt Lake division, which position he continued to hold until his recent promotion on May 1, 1916. As engineer maintenance of way he will have headquarters at Los Angeles.

R. K. Brown

Fred. W. Hankins has been appointed master mechanic of the Cumberland Valley, with office at Chambersburg, Pa., vice Taber Hamilton, resigned, to go to the Vandalia Railroad, and R. G. Bennett has been appointed assistant master mechanic of the Cumberland Valley.

C. D. Porter, assistant engineer of motive power of the Pennsylvania Railroad, at Altoona, Pa., has been appointed master mechanic at Pittsburgh, succeeding H. H. Maxfield, promoted; and C. D. Barrett, assistant engineer of motive power at Williamsport, succeeds Mr. Porter. Lloyd B. Jones, assistant engineer of motive power on the lines west, at Toledo, Ohio, succeeds Mr. Barrett.

Purchasing

S. W. Saye, commercial agent of the Georgia & Florida at Vidalia, Ga., has been appointed purchasing agent, with office at Augusta, Ga., vice J. H. Conley, promoted.

OBITUARY

William A. Deuel, formerly general manager of the Denver, Northwestern & Pacific, died on May 8, at the Mercy Hospital, Denver, Colo.

Warner R. Howell, foreign freight agent of the Pennsylvania Railroad since 1892, with headquarters at Philadelphia, Pa., died suddenly on May 4 at his home in Germantown, at the age of 57. On January 1, 1904, Mr. Howell's duties were extended to the supervision of the import freight traffic, including the ports of New York and Baltimore, as well as Philadelphia.

F. W. Quimby, formerly superintendent of the Dubuque division of the Illinois Central at Dubuque, Iowa, previous to 1895, died recently at his home, in Lafayette, Ind. He was born on September 8, 1847, at Manchester, N. H., and began railway work in 1863 at Concord, N. H., as a locomotive fireman on the Concord Railroad. The following year he went to Chicago, and then served as locomotive fireman and engineman on the Chicago & North Western until 1869. He then entered the service of the Illinois Central as engineman, and subsequently was consecutively roundhouse foreman, trainmaster, assistant superintendent, and later superintendent of the same road. He was then out of railway work for two years, and in January, 1897, was appointed trainmaster of the Chicago, Indianapolis & Louisville, remaining in that position until October, 1913, when owing to ill health he was made train rule examiner.

A. F. Brewer, superintendent of the Utah-Montana division of the Oregon Short Line, who died recently, was born at Cincinnati, Ohio, on December 18, 1859. He entered the service of the Union Pacific as chief clerk to the trainmaster at Laramie, Wyo., on November 1, 1890. On March 1, 1891, he was transferred to Green River, Wyo., as chief clerk to the assistant superintendent. He was made chief clerk to the superintendent of the Idaho division at Pocatello, Idaho, on April 1, 1893. From September 15, 1895, to July 1, 1896, he was chief clerk in the local freight office of the Union Pacific at Salt Lake City, Utah. On the latter date he became chief clerk to the superintendent of the Utah division at Salt Lake City. From March 10, 1901, to May 15, 1902, he was chief clerk to the general superintendent at the same city. From May, 1902, to July 1, 1904, he was car accountant, with office at Salt Lake City; and from July, 1904, to February 8, 1910, car service agent, with headquarters at the same city. As superintendent of the Utah Division he had office at Salt Lake until July 1, 1914, when he was transferred, as superintendent of the consolidated Utah-Montana division, to Pocatello, Idaho. He retained this position until the time of his death on April 17, at Oakland, Cal.

THE "POOLING" OF RAILWAY CARS IN SCOTLAND.—A scheme is at present under the consideration of the Scottish Railway Companies for the common use by the companies of all railway wagons belonging to the various systems in the country. The details of the scheme are at present being arranged, and it is probable that it will be brought into operation shortly. The desirability of adopting a system of "pooling" wagons in the national interests has been publicly discussed in Scotland for some time, and efforts have been made to bring the wagons (freight cars) belonging to private traders within the scope of any scheme which may be adopted. In Scotland the number of wagons owned by private firms is by no means a negligible quantity. One colliery company has at least 7,500 mineral wagons (coal cars) in daily use, and some other firms are understood to possess even larger numbers. The attitude of these companies towards the proposals for the introduction of a "pooling" arrangement is that they would be worse off than they are at present, while firms who are not so well supplied with wagons would reap all the benefit.—*Railway Gazette, London.*

Equipment and Supplies

LOCOMOTIVES

THE EUREKA NEVADA RAILWAY has ordered one Prairie type locomotive from the H. K. Porter Company.

THE RIVER TERMINAL RAILWAY has ordered 2 six-wheel switching locomotives from the Baldwin Locomotive Works.

THE PENNSYLVANIA RAILROAD has issued inquiries for 75 Mikado locomotives for the Lines East of Pittsburgh.

THE LEHIGH VALLEY has issued inquiries for 40 Santa Fe type locomotives and 30 Pacific type locomotives for freight service.

THE BIRMINGHAM RAIL & LOCOMOTIVE COMPANY, Birmingham, Ala., is in the market for a 60 to 80 ton Mogul type or ten-wheel locomotive.

THE AMERICAN CAR & FOUNDRY COMPANY has ordered one locomotive from the Baldwin Locomotive Works for use at its Chicago plant.

THE DELRAY CONNECTING RAILROAD has ordered one superheater eight-wheel switching locomotive from the American Locomotive Company. This locomotive will have 22 by 28 in. cylinders, 51 in. driving wheels, and a total weight in working order of 208,000 lb.

THE TERMINAL RAILROAD ASSOCIATION OF ST. LOUIS, reported in the *Railway Age Gazette* of April 21 as being in the market for 10 or 12 switching locomotives, is reported to have ordered 12 six-wheel switching locomotives from the American Locomotive Company.

THE HERMSTOLTZ COMPANY of Rio de Janeiro has ordered 3 four-wheel tank engines from the American Locomotive Company. Two of these will have 10 by 16 in. cylinders, 30 in. driving wheels, and a total weight in working order of 37,000 lb. The third will have 11 by 16 in. cylinders, 33 in. driving wheels, and a total weight in working order of 39,000 lb.

THE MAINE CENTRAL has ordered 6 Mikado and 2 six-wheel switching locomotives from the American Locomotive Company. The Mikado type locomotives will have 26½ by 30 in. cylinders, 63 in. driving wheels and a total weight in working order of 275,000 lb.; the six-wheel switching locomotives will have 21 by 28 in. cylinders, 51 in. driving wheels, and a total weight in working order of 166,000 lb. All these locomotives will be equipped with superheaters.

THE BOSTON & MAINE has ordered 23 six-wheel switching, 2 eight-wheel switching, 25 Consolidation and 10 Pacific type locomotives from the American Locomotive Company. The six-wheel switching locomotives will have 19 by 26 in. cylinders, 51 in. driving wheels, and a total weight in working order of 145,000 lb. The eight-wheel switching locomotives will have 25 by 30 in. cylinders, 57 in. driving wheels, and a total weight in working order of 240,000 lb. The Consolidation type locomotives will have 24 by 30 in. cylinders, 61 in. driving wheels, and a total weight in working order of 211,000 lb., and the Pacific type engines will have 22 by 28 in. cylinders, 73 in. driving wheels, and a total weight in working order of 235,000 lb. All these locomotives will be equipped with superheaters.

FREIGHT CARS

THE CAROLINA & YADKIN RIVER is reported in the market for 80 to 100 box cars.

THE NEW YORK, CHICAGO & ST. LOUIS is inquiring for prices on 10 caboose car underframes.

THE MIRANDA SUGAR COMPANY has ordered 50 cane cars from the American Car & Foundry Company.

THE CANADIAN GOVERNMENT RAILWAYS are inquiring for 1,000 50-ton Fowler type box cars and 500 40-ton all-wood box cars.

THE HAVANA CENTRAL has issued inquiries for 200 30-ton box cars, 150 30-ton flat cars, 25 30-ton cattle cars and 300 20-ton flat cars.

THE MISSOURI PACIFIC has indefinitely postponed its inquiry for 1,000 general service cars, mentioned in the *Railway Age Gazette* of March 31.

THE NORFOLK SOUTHERN, reported in the *Railway Age Gazette* of May 5 as being in the market for 250 freight cars, will build these cars in its own shops.

THE ANACONDA COPPER MINING COMPANY, Anaconda, Mont., has ordered 88 cathode flat and anode rack cars from the Mount Vernon Car Manufacturing Company.

THE ILLINOIS OIL COMPANY, Rock Island, Ill., is in the market for 20 tank cars, instead of 10 caboose car underframes, as erroneously stated in the issue of May 5.

THE CUBAN CENTRAL has issued inquiries for 50 30-ton flat cars, 150 30-ton box cars, 10 30-ton caboose cars, 100 25-ton flat cars, 50 15-ton narrow gage box cars and 5 15-ton narrow gage flat cars.

THE AMERICAN ROLLING MILL COMPANY, Middletown, Ohio, reported in the *Railway Age Gazette* of April 7 as inquiring for 10 gondola cars, has ordered 10 hopper cars from the Pressed Steel Car Company.

PASSENGER CARS

THE NEW YORK CENTRAL is building 3 dining cars in its shops at West Albany, N. Y.

THE PENNSYLVANIA RAILROAD has issued inquiries for 20 passenger and baggage cars.

THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY has ordered 100 M type trucks from the Baldwin Locomotive Works.

THE MAINE CENTRAL has ordered two coaches and one postal, one smoking, one baggage and one express car from the Pullman Company.

THE CANADIAN GOVERNMENT RAILWAYS have ordered 20 second-hand sleeping cars, 10 second-hand tourist cars and one second-hand dining car from the Pullman Company and a number of second-hand coaches from Hotchkiss, Blue & Co.

IRON AND STEEL

THE MAINE CENTRAL has recently placed orders for 7,500 tons of rails.

THE NEW YORK, NEW HAVEN & HARTFORD has ordered 20,000 tons of rails from the Bethlehem Steel Company.

THE BOSTON & MAINE has ordered 8,000 tons of rails from the Pennsylvania Steel Company and 10,000 tons from other companies.

THE ANN ARBOR has ordered 1,500 tons of 85-lb. rails from the Lackawanna Steel Company for delivery in May, June and July, 1917.

MACHINERY AND TOOLS

THE CHICAGO, BURLINGTON & QUINCY is asking for prices on two heavy-duty universal milling machines, one 2½ by 26 in. turret lathe, three 3¼ by 36 in. turret lathes, two 18 in. tool lathes, two 24 in. engine lathes, one 16 in. portable engine lathe, one 28 in. heavy-duty engine lathe, three 28 in. heavy-duty shapers, one 36 in. heavy-duty crank planer, four heavy-duty upright drill presses, one 24 in. vertical turret lathe, one 42 in. vertical turret lathe, one heavy pattern link radius grinder, one double-end shear with 15 in. throat, one automatic flue-cutting and scarfing machine, one 1½ in. triple-head bolt cutter, one 3,000 lb. double-frame steam hammer, one 1,500 lb. single-frame steam hammer, one serpentine shear, one single-end punch and shear, two flue-welding machines to weld 2¼ in. flues, one 24 in. hinged molding machine, with air turn-over attachment for brass work, seven 220 volt direct-current motors, thirteen 440 volt alternating current motors.

Supply Trade News

James C. Halladay, for many years a railway supply manufacturers' agent, died at his home in Chicago, Ill., on May 3.

Virgil G. Bogue, consulting civil engineer of New York, announces the removal of his office from 15 William street to 26 Cortlandt street.

The Westinghouse Electric & Manufacturing Company announces that the strike for an eight-hour day has broken down and the men have returned to work.

C. F. Schroeder, treasurer of the Schroeder Head Light Company, Evansville, Ind., was killed in the railroad accident at New Decatur, Ala., on Saturday, May 6.

The general offices of the Standard Heat & Ventilation Company in New York have been removed to rooms 1504 and 1505 in the City Investing building, at 165 Broadway.

P. T. Ryan, assistant superintendent of The Pullman Company at St. Louis, Mo., has been appointed district superintendent, with headquarters at Cincinnati, Ohio, vice J. P. McPhillips, deceased.

H. L. Breckenridge, for the past three years purchasing agent of the American Locomotive Company at Montreal, has been appointed purchasing agent of the Lima Locomotive Corporation, Lima, Ohio.

Sherritt & Stoer Company, Inc., 603 Finance building, Philadelphia, have been appointed the exclusive sales agents of the Gardner Machine Company for the Philadelphia district, and will carry in stock a representative line of Gardner disc grinders for metal and woodwork, ball bearing polishing machines and other Gardner products.

Enos M. Barton, chairman of the board of directors of the Western Electric Company, died, as was briefly noted in last week's issue, at his Southern home at Biloxi, Miss., May 3. Mr. Barton was one of the founders of the company, and for 26 years, ending in 1908, served as its president. He was a native of Jefferson county, N. Y. At the age of twelve he became a telegraph messenger at Watertown and later worked as a telegraph operator. In 1864 he was a night operator on the New York Central, attending meanwhile first year classes at the University of Rochester. He worked as a telegraph operator in New York during the Civil War, sending night press reports, and afterwards became chief operator of the Western Union office at Rochester. About 1869, George W. Shawk, foreman of the Western Union shop at Cleveland, bought part of its equipment and engaged in such miscellaneous work as he could pick up, including the making of inventors' models. Mr. Barton went into partnership with him, and helped establish what was to be later known as the Western Electric Company. Mr. Shawk later sold his interest to Elisha Gray, who had been the shop's best customer, and the firm name became Gray & Barton. A little later, General Anson Stager, general superintendent and afterwards vice-president of the Western Union Telegraph Company, became an equal partner in the firm, on condition that the business should be removed to Chicago. The shop, in addition to its odd jobs and repair work, gradually engaged in the manufacture of American District signal boxes and registers, fire alarm apparatus, annunciators, and Morse instruments. In 1872 the Western Electric Manufacturing Company was incorporated to continue the business of Gray & Barton and to take over the Western Union Telegraph Company's instrument shop at Ottawa, Ill. General Stager was the new company's first president. Mr. Barton was its secretary and later its vice-president. The Western Electric Manufacturing Company made telephonic equipment for the Western Union Telegraph Company during the fierce war waged by that company and the American Bell Telephone Company for the control of the telephone industry. When peace was made in 1879, and the Western Union Company retired from the telephone field, the Western Electric Company was organized to absorb the Western Electric Manufacturing Company and certain manufacturing licenses of the American Bell Telephone Company. General Stager was made president and Mr. Barton vice-president, continuing in that office until General Stager's death in 1887. Later he became its president.

E. M. Barton

Charles A. Ford, superintendent of the transportation department of the Steelton plant of the Pennsylvania Steel Company, resigned May 8, to accept a position in the operating department of the Chicago, Rock Island & Pacific Railroad at Chicago. He has been succeeded by J. H. MacDonald, of the traffic department of the Pennsylvania Railroad.

The following is a list of those recently appointed district managers of sales for the Midvale Steel Company, the Cambria Steel Company and the Worth Brothers Company; all of these except E. H. Harris and R. E. Dexter were formerly with the Cambria Steel Company: L. B. Morris, 165 Broadway, New York; H. W. Hayes, 40 Court street, Boston; J. E. McLain, Oliver building, Pittsburgh; Edson H. Harris, Widener building, Philadelphia; R. E. Dexter, Penobscot building, Detroit; H. P. Hubbell, Chemical building, St. Louis; J. L. Adams, Union Trust building, Cincinnati; W. B. Smyth, Swetland building, Cleveland; W. K. Stone, Candler building, Atlanta; Clifford J. Ellis, McCormick building, Chicago.

Steel Corporation's Unfilled Orders

Unfilled orders of the United States Steel Corporation increased 498,550 tons in April, bringing the tonnage on hand at the end of the month to 9,829,551 tons, the highest on record. The unfilled orders on March 31, 1916, were 9,331,001 tons; on February 29, 1916, 8,568,966 tons; on January 31, 7,922,767 tons, and on April 30, 1915, only 4,162,244 tons. The daily shipments in April averaged about 51,000 tons, and orders were received at the rate of about 71,500 tons a day.

TRADE PUBLICATIONS

Work Done.—The Stone & Webster Engineering Corporation, Boston, has issued a booklet containing a list of power development and construction projects completed by this company, or in progress in February, 1916.

High-Speed Steel.—The Vanadium-Alloys Steel Company, Pittsburgh, Pa., has recently issued a new folder which describes the company's Red Cut Superior high-speed steel. The pamphlet offers suggestions concerning heat treatment.

Gasolene Hoists.—The Lidgerwood Manufacturing Company has issued Bulletin No. 16, illustrating and describing a line of hoists operated by gasolene engines. These hoists are intended for use where electric current is not obtainable, and where coal and water suitable for boiler use are difficult to obtain.

Building Materials.—E. M. Long & Sons, Cadiz, Ohio, have issued an attractive 24-page booklet describing their lumber and other products, including O. G. fir gutters used extensively on railway buildings. The book is well illustrated with a large number of photographs showing various sections of their plant and their products.

Drinking Fountains.—The Henry Giessel Company, 28 East Jackson boulevard, Chicago, has recently issued an illustrated booklet describing the "North Pole" sanitary drinking fountain, designed for use in passenger cars. The booklet includes a detailed explanation of the apparatus accompanied by a diagrammatic illustration, and photographs of installations on various railroads.

Railway Construction

ALABAMA & MISSISSIPPI.—Work is nearing completion on the extension between Leakesville, Miss., and Evanston, 20 miles, and the company expects to operate trains from Vinegar Bend, Ala., to Pascagoula, Miss., by June 1. J. H. Bonnable is the contractor. Control of the Pascagoula-Moss Point Northern was secured by the Alabama & Mississippi in July, 1915, and on completion of the above work the consolidated line will have a total length of 76 miles. (October 29, p. 828.)

ANTHONY & NORTHERN.—This company will soon commence the construction of a branch from Larned, Kan., north, an indefinite distance.

CRITTENDEN RAILWAY.—This company is planning to extend its line, it is said, through the St. Francis valley, Arkansas. The company now operates a line from Earl, Ark., south to Heth, 15 miles, with branches from Crittenden east to Felco; from Shell Lake to timberlands, and from Heth southeast to Olneyville; in all, 29 miles.

EASTERN MAINE.—This company, which was incorporated in Maine, and started surveys in 1911 for a line to be built from Bangor northeast to Great Pond, thence north to the head of Nicatous lake and via Carroll, Prentiss, Bancroft and Haynesville to Houlton, 112 miles, was recently authorized to issue bonds, it is said, by the Public Utilities Commission of Maine. The company has made a mortgage for $400,000, and it is understood that construction work will be started in the near future. The location of the section from Bancroft to Houlton, 32 miles, was made in 1914. The line will traverse a large timberland, agricultural and game region. G. W. Maxfield, president; F. O. Beal, vice-president, Bangor.

EDMONTON, DUNVEGAN & BRITISH COLUMBIA.—Track laying is reported completed on the Grand Prairie branch from Spirit River, Alta., to Grand Prairie, 60 miles. (December 10, p. 1112.)

EXPORT PHOSPHATE RAILWAY & TERMINAL COMPANY.—A franchise has been granted this company, it is said, to build a railway into Tampa, from Mulberry, Fla., about 30 miles. The part of the line inside the city limits of Tampa is to be electrified within two years, and eventually the entire line is to be electrically operated. H. L. Pierce, president. The headquarters of the company are at Tampa. (See Florida Roads, May 5, p. 1017.)

FARNHAM & GRANBY.—An extension of two years has been granted to this company by the Dominion parliament in which to build the projected line from Farnham, Que., on the Canadian Pacific, north to Granby, thence northeasterly via Windsor Mills. C. L. Hervey, Montreal, Que., is a provisional director. (November 12, p. 922.)

FLORIDA ROADS (ELECTRIC).—The question of building an electric line from Tallahassee, Fla., northeast to Thomasville, Ga., about 35 miles, is now under consideration. A. S. Metzner, Tallahassee, is said to be interested.

GEORGIA ROADS (ELECTRIC).—The Federal Construction Company, Atlanta, Ga., has been organized to build an electric railway, it is said, from Creighton, Ga., south to Atlanta, about 50 miles.

NEW YORK SUBWAYS.—The New York Public Service Commission, First district, is asking for bids on May 23, for the construction of Route No. 31, which is the Livonia avenue elevated extension of the Eastern parkway subway in the borough of Brooklyn to be operated by the Interborough Rapid Transit Company. The commission is also asking for bids on May 25, for the construction of section No. 2 of Route No. 8, which is a part of the Fourteenth Street-Eastern subway to be operated by the New York Municipal Railway Corporation. These two contracts will complete the letting of construction work on both lines.

NORFOLK & WESTERN.—A contract has been given to W. W. Boxley & Co., Roanoke, Va., for the second-track work between Joe, W. Va., and Alnwick. (April 28, p. 974.)

OCILLA SOUTHERN.—This company has made a preliminary survey for a line from Perry, Ga., north to Macon, and expects to commence construction work on this 28-mile extension during 1916. Work was completed on October 1, 1915, on the section from Rochelle, Ga., to Pope City, 7.5 miles, and on that date the company began the operation of through service from Nashville, Ga., north to Perry, 110 miles, having leased trackage rights over the Hawkinsville & Florida Southern from Pope City to Hawkinsville, 17.88 miles, and leased for five years the Hawkinsville & Western from Hawkinsville to Perry, 23 miles. (November 12, 1915, p. 923.)

OREGON-WASHINGTON RAILROAD & NAVIGATION.—This company has awarded a contract to Twohy Brothers, Portland, Ore., for the extension of the Vale and Riverside line from Riverside, Ore., to Bendier. The grading work has been completed and track laying is now under way.

PENNSYLVANIA LINES.—This company is constructing an eastbound running track between Marion, Ohio, and Harvey, a distance of five miles. The grade is being reduced from 0.5 per cent to 0.3 per cent. Fifty thousand cubic yards of dirt and 5,000 cu. yds. of rock will be handled. The grading contract has been awarded to P. T. Clifford & Son, of Valparaiso, Ind., and the track work will be done by company forces.

SALT LAKE & LOS ANGELES.—This road has retained H. A. Strauss, consulting engineer, Chicago, to extend the line from Saltair, Utah, to Garfield, five miles, and to electrify the entire line 20 miles. Direct current will be used to operate the system, and power will probably be purchased from private plants in that region. About 400 tons of rails are being delivered, and track-laying will soon begin. The road handles both passenger and freight traffic.

SOUTH RIVER LUMBER COMPANY.—This company is building with its own forces a logging railroad in connection with its plant at Cornwall, Va. Grading work has been finished on 1.5 miles, but no track has yet been laid. There will be 14 bridges on the line varying in length from 30 ft. to 44 ft. each. The line is being built to carry logs, bark and wood. Charles Steele, vice-president, Sunbury, Pa.

WILLIMANTIC & MANCHESTER (ELECTRIC).—A contract has been let to C. E. Coon, Cleveland, Ohio, for building a 20-mile line from Manchester Green, Conn., east to Willimantic. William S. Hyde, president, Manchester.

RAILWAY STRUCTURES

AKRON, OHIO.—The Erie has awarded a contract to Kidder & McCourt for the grading of a new yard. About 72,000 yds. of material will be handled.

BAY CITY, TEX.—The Gulf, Colorado & Santa Fe will build a new station at Bay City. The proposed structure will cost $15,000.

BELLAIRE, OHIO.—The Baltimore & Ohio will build a new freight house at Bellaire. The proposed structure is to be 40 ft. by 160 ft. with a covered platform 16 ft. by 80 ft. and an open platform 16 ft. by 190 ft. There will be four tracks, each of ten-car capacity to serve the freight house. The company also plans to build a two-story brick office building, 40 ft. by 40 ft., at the same place.

CAYUSE, ORE.—The Oregon-Washington Railroad & Navigation Company will receive bids this month for an extension to a bridge over the Umatilla river. The work will involve the erection of an 80-ft. through plate girder span and will cost in the neighborhood of $12,000.

CHIPPEWA FALLS, WIS.—The Chicago, St. Paul, Minneapolis & Omaha has awarded a contract to A. Guthrie & Co., St. Paul, Minn., for an 800-ft. bridge across the Chippewa river.

CLOVERPORT, KY.—According to press reports, plans are being made by the Louisville, Henderson & St. Louis to rebuild the railroad shop at Cloverport, which was destroyed by fire early in March.

FLINT, MICH.—The Pere Marquette contemplates the construction of an additional freight yard which will contain about seven

miles of new track, and will include a coal dock, water station and four-stall engine house. The improvements will cost about $100,000.

FREEPORT, TEXAS.—The Houston & Brazos Valley has awarded a contract for a railway and wagon bridge across the Brazos river to A. Glitheroe, Houston, Texas. (Page 774, March 31.)

JOSEPH, ORE.—The Oregon-Washington Railroad & Navigation Company will build three bridges on the Joseph branch—over the Grande Ronde river, Cabin creek and Looking-glass creek, respectively. The project will involve the erection of two 80-ft. through plate girder spans, three 20-ft. deck plate girder spans and two 40-ft. deck plate girder spans. The three bridges will cost about $36,000.

LAGRANDE, ORE.—The Oregon-Washington Railroad & Navigation Company opened bids on May 6 for the construction of a frame nine-stall roundhouse with brick exterior. The structure will cost about $30,000.

LOS ANGELES, CAL.—The Atchison, Topeka & Santa Fe will replace four permanent bridges and several temporary bridges destroyed by washouts between Los Angeles, Cal., and San Diego.

LAS VEGAS, NEW MEX.—The Atchison, Topeka & Santa Fe will spend about $330,000 on improvements at Las Vegas. They will include a 34-stall reinforced concrete roundhouse, a brick power house, 35 ft. by 70 ft., a 600-ton coal storage and service plant, and a lavatory building, 24 by 120 ft. The structure will be one story high, with concrete foundation and floor, and brick walls. There will also be a 100-ft. concrete cinder pit and incidental track changes.

LEVIS, QUE.—The Intercolonial is revising plans, it is said, for a new passenger station, to be built at Quebec.

MCMINNVILLE, TENN.—The Nashville, Chattanooga & St. Louis contemplates making plans in the near future, for a new passenger station to be built at McMinnville. If the company decides to build the station the work will be carried out by company forces.

MINNEAPOLIS, MINN.—The Minneapolis & St. Louis and the Chicago, Milwaukee & St. Paul will jointly erect a viaduct over the tracks on West Lake street, Minneapolis. The structure will be about 1,700 ft. long, including the approaches.

MONON, IND.—The Chicago, Indianapolis & Louisville is preparing plans for a stone depot to be built at a cost of $15,000 to $20,000.

ST. PAUL, MINN.—Work is under way on the new office building of the Chicago, St. Paul, Minneapolis & Omaha, which is being constructed on the site of the present offices. The George A. Fuller Company has the contract for the work, which involves the erection of an eight-story fireproof steel-frame structure, 128 ft. by 99 ft. The building will be faced with Bedford stone for the first story and with brick for the other stories, and will cost about $400,000. (Page 186, January 28.)

SCRANTON, PA.—Plans for eliminating eleven grade crossings, and for raising its tracks from five to fifteen feet above the present levels have been submitted by the Delaware & Hudson, it is said, to the city officers of Scranton for approval. The improvement will extend from Parker street on the north to the city line on the south. All the present grade crossings are to be eliminated either with overhead crossings or subways.

WEST BURLINGTON, IOWA.—The Chicago, Burlington & Quincy has awarded a general contract for the erection of additional shop buildings to Westinghouse, Church, Kerr & Co., New York. The work done will be done jointly by this company and the Burlington's own forces.

WHITEFISH, MONT.—The Great Northern contemplates the construction of a 15-stall, 116-ft. frame extension to its roundhouse, an extension to its boiler house, an extension to the cinder pit and some additional track work. The improvements will cost about $35,000.

YATES CITY, ILL.—The Chicago, Burlington & Quincy has awarded a contract to the Railroad Water & Coal Handling Company, Chicago, Ill., for the erection of a water station here, which will involve the laying of 13,000 ft. of 8-in. cast iron pipe and a 30-h.p. oil engine directly connected to a triplex pump.

Railway Financial News

CANADIAN NORTHERN.—A statement submitted to the Canadian parliament as part of the argument for the proposed $23,000,000 loan to the Canadian Northern and Grand Trunk Pacific, shows that the Canadian Northern has a floating debt of $92,450,883; total bounded indebtedness of $358,770,798, and fixed charges, exclusive of subsidiary companies, amounting to $12,989,059 per year. Net earnings for the last fiscal year were $7,088,160.

CATSKILL MOUNTAIN RAILWAY.—E. E. Olcott, president of the Hudson River Day Line; A. V. S. Olcott, general manager of the Catskill Evening Lines, and George H. Beach, manager of the Catskill Mountain House, have bought under foreclosure sale for $28,000 the Catskill Mountain Railway. This road runs from Catskill Landing, N. Y., to Cairo, 13 miles.

GRAND TRUNK PACIFIC.—A statement submitted to the Canadian parliament as part of the argument for the proposed $23,000,000 loan to the Canadian Northern and Grand Truck Pacific, shows that the Grand Trunk Pacific has total interest payments to be met in 1916 and 1917 of $12,924,271. In addition, there was an operating deficit of $1,200,000 for the Mountain division, and $300,000 for the branch lines. Net earnings of the Prairie division were $6,000,000, and the Lake Superior branch paid a rental of $400,000.

LONG ISLAND.—Testimony in the suit brought by Dick Brothers, New York and Boston, has been closed, and Justice Lehman has announced that attorneys may submit briefs up to July 30, and that decision will be given some time after the summer recess of the court.

MISSOURI, KANSAS & TEXAS.—The United States district court of St. Louis has ordered the interest on the $39,999,500 4 per cent first mortgage bonds to be paid. The interest matured on December 1, 1915.

MISSOURI PACIFIC.—The Bankers Trust Co., trustees of the first collateral mortgage securing the $10,000,000 issue of 30-year gold bonds of the Missouri Pacific, has begun suit against the road in the United States District Court to foreclose the mortgage. The trust company asks that the collateral securities deposited under the mortgage agreement be sold to satisfy the mortgage.

MOBILE & OHIO.—A. Iselin & Co., New York, have bought and are offering to the public $950,000 4½ per cent equipment notes, series J. The offering price is based on the length of maturity, the notes being due semi-annually, the first maturity being December, 1916, and the yield at the offering price 2.75 per cent, and the last maturing 1926, the yield at the offering price being 4.60 per cent.

NEW YORK CONNECTING.—The New York Public Service Commission has approved the issue of $8,000,000 40-year 4½ per cent bonds of the New York Connecting at not less than 94.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—Executives of the Jay Gould estate have brought suit in the United States District Court against the St. Louis, Iron Mountain & Southern to collect payment on a series of notes aggregating $1,741,000. The notes were issued by the Texas & Pacific to the St. Louis, Iron Mountain & Southern and were assigned by that company to the Gould estate subsequent to March 1, 1914.

ST. LOUIS SOUTHWESTERN.—This company has asked the Missouri Public Service Commission for authority to issue $825,000 first terminal and unified mortgage bonds, the proceeds to be used to reimburse the company for expenditures for additions and betterments in 1915.

TENNESSEE CENTRAL.—Judge Sanford, in the Federal Court, has granted the representatives of the second mortgage bondholders, 60 days ending July 4, in which to present a satisfactory reorganization plan. E. L. Doak has been appointed special commissioner to take evidence in the case. Judge Sanford is quoted as congratulating the receivers on the way the road is being managed.

TEXAS & PACIFIC.—See St. Louis, Iron Mountain & Southern.